



Volume 4 Number 21
\$2.95

October 15, 1985

Shopping for Performance and Price

*Compatible Computers
Under \$2,000*

*Business Software
Under \$200*

ISM Express:
256 Colors to Go

Special Report:
Wang in the
PC Market

JDISKETTE:
1.2-Meg Floppies
for Your PC



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standard
in tape
backup
systems.



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ProKey 4.0 keyword macros unsnarl PC use.

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And all these programs have different complicated commands that are tedious to type and easily forgotten. How much easier life would be if all you needed to operate your program was a small vocabulary of sensible words.

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ProKey 4.0 runs on IBM and other compatible MS-DOS computers, and works with 99% of the software they use. \$130 suggested retail price at software dealers everywhere. Or call RoseSoft. (206) 524-2350.



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I'm
IBM
Compatible

The image shows a vintage Apple II computer system. The monitor, which has a small rainbow stripe logo on its lower-left bezel, displays the text "I'm IBM Compatible" in a black serif font on a light blue background. The computer unit is a beige, boxy design with a floppy disk drive on the front. A keyboard with dark keys and a numeric keypad is positioned in front of the computer. To the right of the keyboard is a two-button mouse. The entire setup is on a light-colored surface against a dark background.

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Tired of the perplexing decision about which desk-top computer to buy?

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FEATURES



COVER STORIES

Low-Cost Computing:

Where the Smart Money Is 108

Charles Berman/Low-cost products don't necessarily mean low performance or limited options.

Cost-Conscious Computing 112

Winn L. Rosch/You don't have to pay a fortune for IBM PC quality. Here are six solid machines for less than \$2,000.

COLUMNS/DEPARTMENTS

WHAT'S INSIDE 15

A behind-the-scenes look at the making of *PC Magazine*.

PC NEWS 33

Up-to-the-minute news, product minireviews, interviews, short features, and commentary.

FROM THE EDITOR'S SCREEN

The Price Is (Sometimes)

Right 59

Bill Machrone/The process of pricing software is as mysterious as intuition and as unpredictable as human nature.

LETTERS TO PC MAGAZINE 63

Readers from across the country and around the world share their insights, comments, questions, and criticisms.

THE NORTON CHRONICLES

A Penny Here, a Penny There ... 81

Peter Norton/Norton tells you where in your system you can safely save money.

QUANTUM LEAP

Mass Storage for the More Perfect

PC 99

Ron Jeffries/The 1988 PC and mass-storage alternatives.

Word Processing for the Dollar-Wise 122

Phil Wiswell/Willing to sacrifice some speed or fancy features? You can save big bucks on your word processing package and still get an excellent program. *DisplayWrite II*, *Text*, *PFS:WRITE*, *Executive Writer*, *PC-Write*, and *Perfect Writer* are inexpensive solutions to your word processing worries.

Cost-Effective Database Management 132

Alfred Poor/Although they may not threaten *dBASE II*'s market share, these four under-\$200 database programs will give you more than your money's worth. Despite their low prices, *VersaForm XL*, *PC-File III*, *PC File 'N Report*, and *FormManager* offer considerable ease-of-use and sophistication for serious business applications.

Taking Your Budget into Account 140

Mike Falkner, Pat Fitzhenry, and G. William Dauphinais/If your accounting needs are basic, *Dac-Easy*, *PC-General Ledger*, *In-House Accountant*, and *Accounting for Micros* are low-cost accounting packages that focus on the general ledger, accounts payable, and accounts receivable functions with impressive results.

The Bottom Line on Spreadsheets 150

Jared Taylor/Many users don't need the power of Lotus's *1-2-3*. *Multiplan*, *My Calc*, *Number Works*, and *Magic Worksheet* are less expensive and far less complex spreadsheets on the market that may fill your needs.

COMPUTERS AND SOCIETY

Expressions of Change 103

Stan Augarten/Computers may be changing the way we think and interact with coworkers. A study shows they stimulate us to be more expressive. Do they also encourage aggression?

PROGRAMMING/UTILITIES

Deleting Made Complete 221

Steven Holzman/For the security-conscious, Holzman offers a foolproof method that ensures that a deleted file containing sensitive information cannot be brought back.



Page 158

SPECIAL REPORT

A Professional Micro from Wang.....158

Winn L. Rosch/The Wang Professional Computer combines desktop programming versatility with Wang's famed word processing capabilities. Moreover, it offers a reasonable degree of IBM PC compatibility, but only through the use of special hardware and additional software.

PC Networking, Wang-Style.....173

Bill Catchings/Wang's Local Interconnect Option uses a version of cluster topology to unobtrusively connect up to 225 Wang PCs.



HARDWARE Transportable Color Graphics.....178

Jon Pepper/With the ISM Express, built from some of the best components available, you can carry high-resolution color graphics anywhere.

Improving the PC's Family Ties.....199

Peter Feldmann/Tall Tree Systems resolves the PC family's disk compatibility problem by introducing JDISKETTE—a plug-in peripheral that combines a floppy drive, a board, and software to support the AT's floppy format.

SPREADSHEET CLINIC.....229

Jared Taylor/Users pass along the fruits of their spreadsheet experiences—including useful templates and macros.

POWER USER.....233

Charles Petzold/Some helpful hints from *PC Magazine* readers for using hardware products and applications software more productively.

USER-TO-USER.....241

Paul Somerson/Readers share their helpful hints for getting more effective use out of DOS and BASIC.

PC TUTOR.....249

Charles Petzold/Answers to readers' technical and nontechnical questions on all PC-related subjects.

REVIEWS IN BRIEF.....253

A quick look at some new products.

THE SHORT REPORT.....255

Phil Wiswell/Short takes on interesting new products.

NEW ON THE MARKET.....257

David Obregón/Exciting new product announcements.



SOFTWARE

A Flexible Formula for Application Generation.....183

Frank J. Derfler, Jr./Formula IV, a multiuser database management system, lets you create custom-made database applications by working through menus.

A New Insight into Expert Systems.....191

Robin Webster/Unlike earlier versions of expert systems, *Insight 2* offers a mix of development tools that make knowledge-base creation more like programming.

Workbench: A Program That Means Business.....209

Eric Bank/Easy readability and comprehensive data manipulation have made COBOL a popular mainframe language. *VS COBOL Workbench* offers an array of programming tools with which you can produce standalone, executable COBOL programs on the PC.

BOOK REVIEW.....263

Robert Eckhardt/Reviews of *The Eudaemonic Pie* and *The Planiverse*.

PC MART.....266

PC BLUEBOOK.....268

PRODUCT INDEX.....283

COMING UP.....285

INDEX TO ADVERTISERS.....289

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Infoworld, 1/14/85

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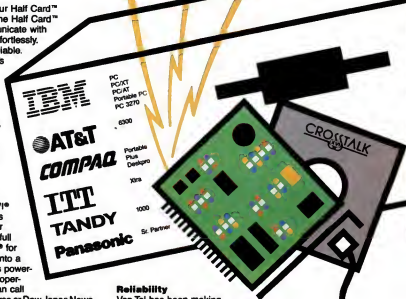
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What's Inside

Outfitting your office with top-quality hardware and software doesn't mean you have to pay top dollar. The products reviewed in this issue would please even a penny-wise Scrooge.

Diana Goldstein and Bob McDonald, partners in a new and struggling design firm, stared dejectedly at the expensive new PC-XT setup that they had just purchased for their fledgling business. In addition to their XT they had bought a plotter and a pricey computer-aided design package. This investment had just consumed much of their income from their first year of operation.

Goldstein scratched her head. "I just realized we spent all this money on expensive equipment, and now we can't even write a letter because we don't have a word processor."

McDonald groaned. "And with all that memory and power just sitting there, we should also be able to do all our accounting on the XT as well, but we don't have any money left to buy an accounting program."

Small Costs Add Up

Many small-business owners facing similar problems will benefit immensely from our cover story on price-conscious computing. It is part of the popular mythology that the more a new software product costs, the more sophisticated, complex, and/or workable it is—and that isn't necessarily true. There is good, usable, practical software available that doesn't demand an unlimited budget.

OK, all you corporate magnates out there! I can see you shrugging your gray-suited shoulders in your plush, ergonomic office chairs, thinking, "Well, what does all that have to do with me?"

Have you checked lately to see how



much the 400 copies of the latest spreadsheet program you ordered cost your company? While a single copy of a popular software package may not cut very deeply into the corporate pocket, several hundred copies can cause any VP's eyebrows (or blood pressure) to rise. On the other hand, a good word-processing program that can be distributed to every employee who has access to a personal computer can do a lot to increase a company's efficiency (not to mention its computer literacy).

Getting Lucky

Of course, tracking down inexpensive programs isn't always easy—some of the best bargains surface simply through luck and word of mouth. For example, we discovered a bargain in *Textra* while doing our recent cover story on word pro-

cessing. Phil Wiswell, the free-lance writer coordinating the project, was sitting in the *PC Magazine* Labs staring bemusedly at his screen when associate editor Barbara Krasnoff happened to walk in. "You want to hear something neat?" he asked.

In the parlance of the *PC Magazine* editorial department, "neat" can mean anything from "interesting" to "the most exciting thing since plastic." So Krasnoff held her breath and waited.

"This," Wiswell said, pointing to a disk, "is *Textra*'s new version 3.1A, which has a lot of nice new features and is retailing for \$49.95. And this," he pointed to a second, "is *Textra*'s old version 3.1, which is lacking those features but is still a nice little word processor—and it's retailing for \$9.95!"

Now, in today's inflationary world, \$9.95 will hardly buy you a floppy disk, never mind an entire program. And \$49.95 ain't bad either. Krasnoff made appropriate noises of enthusiastic appreciation and immediately left to spread the word—especially to associate editor Lisa Kleinman, who was even then beginning her search for low-cost programs.

As a result of this discovery (not to mention his familiarity with word processors), Wiswell was assigned to search out other word processing bargains. Other writers on the project included Al Poor, one of *PC Magazine*'s database experts, who investigated several low-cost databases; Bill Dauphinais, a partner in Price Waterhouse and author of the Price Waterhouse Report, was the perfect person to fry out cut-rate accounting pack-

WHAT'S INSIDE

ages; and Jared Taylor, *PC Magazine's* own spreadsheet clinician, looked at the bottom line in spreadsheets.

Another interesting new way of spreading low-cost programming around

is through a method called "shareware." Copies of such products as *PC-File* and *PC-Talk* are free, but you're encouraged (usually in a paragraph that comes up before the main menu) to send a check to

the author, if you find the program to your liking (as many do). The check, of course, doesn't only buy retroactive ownership of the program—it also enables you to receive the latest version, along with notices of updates and of other products developed by the company.

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Inexpensive Alternatives

Bargain-priced software isn't the only way a computerized company can keep its costs down. In a sidebar to our cover story, assistant editor Charles Bermant describes how large-volume buyers are also beginning to look into site licensing. Although the terms of such agreements vary, site licensing permits a company to copy a program the number of times

Tracking down inexpensive programs isn't always easy—some of the best bargains surface simply through luck and word of mouth.

specified in the contract. Some contracts also specify where the program is to be used—even allowing employees to take the program home.

Meanwhile, contributing editor Winn Rosch has assembled a group of machines that offer IBM PC compatibility while putting less pressure on your pocketbook. These include not only Leading Edge and Tandy compatibles, but also IBM's own Portable PC. In addition, Rosch has contributed two handy sidebars in which he describes how you can save money by assembling your PC yourself and how to find and assess a used computer.

Luckily for the struggling partnership of Goldstein and McDonald, they discovered some of the budget-priced equipment and software described in this issue. Their flattened purse was able to weather the purchase of the needed word processing and accounting software. And they were able to turn their attention to their real problem—how to attract enough clients to make their firm grow and prosper. ■

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PC News

COMMUNIQUÉS	43
PC UPDATE	46
TRANSMISSIONS	51
DOWNTIME	56

IBM DROPS CMI DISKS

BY CHARLES BERMANT

BOCA RATON, Fla.—IBM will no longer use fixed disks manufactured by Computer Memories Inc. for its PC AT. After the CMI contract expires at year's end, the high-end PC will be sold containing hard disks manufactured by other sources and by IBM itself.

However, a CMI representative said that the company continues to stand behind its product, adding that it now has 4 months to develop a strategy to deal with the loss of IBM's business.

"We have had an excellent relationship with IBM," says Joe Lloyd, product marketing manager of the Chatsworth, Calif., firm. "They're fulfilling our contract with us, and we are fulfilling our agreement with them. If the drive was bad, why has IBM continued to take it for a continued period? If it doesn't work, why would they continue our contract for the next 4 months?"

The AT, released last August, exceeded IBM's initial sales expectations, and its introduction was followed by a February announcement of hard-disk-equipped enhanced version shortages. IBM blamed the shortages on CMI's inability to produce the disks quickly enough. Widespread reports of CMI disk failures, however, called attention to IBM's sole source of this vital part.

"We had to go through every single box. There was a hassle factor," says Jeffrey McKeever, president of MicroAge computer stores. "It was a reliability thing. It causes problems if a manufacturer has to test all units."

McKeever doesn't think that the disk drive issue had any impact on the marketplace or the AT's credibility, claiming, "The end user wasn't familiar with the problem."

Solid Future

The AT, with or without CMI, has a solid future. A bevy of copy-cat machines has solidified its position as an industry standard, at least until another

machine to emulate comes along. A major advertising push for the entire AT line is expected this fall, with some insiders expecting price cuts.

Installation of third-party disks, at first a necessity because of the shortage of the enhanced ATs, has become a viable consumer option. A range of AT add-ons are expected, including an 80-megabyte drive with a 25-millisecond access

time from Tallgrass.

"Demand for our AT product has tapered off," says Bob Stroh, vice president of marketing and sales for Mountain Computer Inc. of Scott's Valley, Calif. "But it is far from zero. We were anticipating a short window. It is longer than we expected and hasn't closed yet."

"I think dealers prefer to buy
(continued on next page)

SubLOGIC Draws on PC's Fine Artistic Potential

BY VIRGINIA DUDEK

CHAMPAIGN, Ill.—Software wizard Bruce Artwick has done it again. Artwick's new game program, *Jet*, joins best-selling *Flight Simulator* and *Night Mission Pinball* as the reigning PC graphics standards. The ability of these products to take full ad-

vantage of the graphics capabilities of the PC puts competing software to shame. And in the face of undeserved industry-wide criticism about the graphics ability of the IBM PC, Artwick's company offers high-performance graphics hardware that has the punch of a sophisticated graphics workstation at a

fraction of the traditional cost.

"There's nothing that comes close to the SubLOGIC graphics system—aside from a \$40,000 system," according to Artwick. The complete SubLOGIC High-Speed Graphics System (HSGS) retails for \$2,990. "It can draw lines on screen and draw shaded-in polygons at a rate of 100 million pixels per second. It can be used to create a complete training environment, such as multiple simulations for driving and flying and for three-dimensional and solid modeling."

By Popular Demand

"A lot of people have asked us for this," continues Artwick, "and can now afford it. The graphics performance is high, but the public doesn't know all that it can do. The applications are not obvious." Some expected uses include architectural design, astronomy, broadcast

(continued on next page)



SubLOGIC's High-Speed Graphics System was used to create the *Jet* flight simulator.

IBM Drops CMI Disks

(continued from preceding page)

the unenhanced version. They find the opportunity to make more money on a third-party hard disk while delivering equivalent or higher quality to the customer."

CORE Concerns

"We can say we told you all along," says Hal Prewitt, president of CORE International of Delray Beach, Fla. "The general feeling is that the market is starting to wake up, and IBM is admitting it had a problem. And most major users of ATs are specifying CORE or CORE-like drives instead of those from IBM or CMI."

Prewitt was an early critic of the CMI drive, saying that it was not reliable and did not take advantage of the AT's power.

"The drive was absolutely bad," he says. "They could not

get all the bugs worked out. They could have worked in an automatic head retraction and fixed some of the technical design details, and it would have been a fairly good drive. But there was no easy way to fix it once it was manufactured; they needed to scrap it and start all over again."

"What does he know?" says CMI's Lloyd in response to Prewitt's comment. "He's entitled to his opinion. The drive still performs. It's a good product. We've shipped a lot of them. We are price competitive with anybody."

Prewitt says that CORE International is now the largest supplier of high-performance drives for the AT. And as far as CMI's predicament, he was hardly sympathetic.

"We're almost pleased to see this happen," he says. "We didn't like to see people using that kind of technology." ■

New Framework Boasts Needed Improvements

BY CRAIG STINSON

CULVER CITY, Calif.—Ashton-Tate has announced a complete overhaul of its integrated *Framework* software package.

Framework II is intended to both answer criticisms of Ashton-Tate's original *Framework* and implement features not included in the original because of competitive pressures and a desire to reach the market quickly.

At its September introduction, Ashton-Tate officials were optimistic that the new product would satisfy critics of the old. The original *Framework* was

something of a sales disappointment, despite the fact that it elicited some excellent reviews. Part of the problem was a widespread wariness on the part of users regarding all-in-one software of any kind (increased by the advent of TopView and the promise of Microsoft's Windows).

Framework II, like its predecessor, will carry a suggested \$695 retail price. Registered users of *Framework 1.0* or *1.1* will be given an opportunity to upgrade for \$140, roughly 20 percent of the price of the new product.

Same Window

Probably the most important change—the one that will improve *Framework* the most—has to do with memory management. The original program was more than lavish in its use of internal resources, which limited its utility even for those with 640K-byte systems. The new product addresses this issue in three ways.

First, it supports the Intel/Lotus/Microsoft Expanded Memory Specification (EMS). Users with Above Board or other EMS-compatible memory boards will be able to make up to 8 megabytes of RAM available to *Framework II*.

Second, for the benefit of those who don't have EMS boards but do have hard disks, *Framework II* offers an optional virtual memory driver. This feature allows the hard disk to serve as an extension of RAM. When internal memory gets full, it simply swaps out the least-recently used frame to disk, bringing it back in later as needed. This approach to memory management may result in occasional momentary delays as *Framework II* accesses the disk, but the user will be able to create files of virtually any size, given sufficient disk space.

SubLOGIC Draws on PC's Fine Artistic Potential (continued from preceding page)

animation, CAD/CAM, educational simulation, medical modeling, molecular modeling, and vehicle simulation.

The HSGS card, developed by SubLOGIC project engineer Dave Denhart, takes up one PC expansion slot. The Graphics Microprocessor (GMP) chip set designed specifically for enhanced graphics enables the system hardware to do geometric calculation without using the host processor. The system has a 70,000-line-vectors-per-second draw rate and cranks out up to 640 by 400 pixels of resolution with a 16-color display out of a palette of 4,096.

Built-in display-list buffers and programmable patterns account for faster execution by the custom GMP chip set. The 256K of display-buffer RAM on-board is isolated from the host processor's address space, thereby eliminating slowdowns because of host-processor limitations while enabling full use of its memory for other programs.

New Year's Resolution

The GMP chip set's display-buffer resolutions can go as high

as 2,048 by 2,048 by 32 bytes. The palette contains over 16 million colors, and 4,096 can be displayed at any one time.

Automatic clipping within a programmable window is software controlled, allowing window modification at any time. If used with the optional SubLOGIC Video Shift Register (VSR) chips, a stippling feature



Bruce Artwick

allows display of around 1,800 colors simultaneously, each requiring only 4 bits of memory per pixel.

"This set will be called the modular simulation and animation series," explains Artwick.

The HSGS board includes an alphanumeric device driver, a graphics-primitives library, high-level language interfaces, diagnostic utilities, and demonstration programs. Future options will be available, such as an NTSC converter, 3-D graphics software, and a 3-D auxiliary processor.

Airborne

SubLOGIC's new *Jet* software is just as impressive as its hardware—and infinitely more accessible at \$49.95 (for a full product review see "The Flight Stuff," p. 38). The program faithfully simulates the operation of a jet fighter in noncombat free-flight, dog-fight, and target-strike scenarios. You arm your aircraft with air-to-air missiles, air-to-ground missiles, or smart bombs depending on which combat mode you select from the game menu.

The user is drawn into the action by the movement, speed, color, and solid visuals of the animated graphics. *Jet's* three-dimensional graphics elicit real physiological responses from the user, and that perhaps is its greatest achievement. ■

Third, *Framework II* has implemented a sparse-matrix technique for spreadsheets as well as other economizing measures to enhance the efficiency of memory use. You can create significantly larger spreadsheets in *Framework II* than you could in *Framework 1.1*—even without going to expanded or virtual memory. And files imported into *Framework II* from the original program are expected to occupy 50 percent less RAM in the new system.

Dialing for Data

For its telecommunications module, the original *Framework* had simply grafted a standalone terminal program—Mycroft Labs' *MITE/MS*—into its environment. When the user entered that terminal program, all the familiar *Framework* metaphors and commands were gone. *Framework II*'s module still has "the guts of

into a spreadsheet. In the original *Framework*, it was necessary to do some extensive programming to get text data into spreadsheet or database frames.

Let's Be Friends

On the export side, the original *Framework* offered only the ability to write ASCII text files and dBASE comma-delimited files. The current product adds export commands for *IBM DCA/DisplayWrite*, *WordStar*, and *MultiMate*. The facility to convert *Framework II* spreadsheets to 1-2-3 format is not included in the initial release, but it will be included in an upcoming revision, according to Ashton-Tate.

Various enhancements have been made to *Framework*'s word processing module. It now incorporates an 80,000-word spelling checker, offers discretionary hyphenation and non-breaking space characters, and



Framework author Robert Carr improved an already formidable program.

MITE," according to Ashton-Tate, but it is now completely integrated into the *Framework* environment.

The original *Framework* offered utility programs for importing only 1-2-3, DIF, and *WordStar* data into the *Framework* environment. The new *Framework* is altogether much more versatile than its predecessor when it comes to moving information from one environment to another.

Framework II supports background communications and direct transfer of captured data into spreadsheet and database frames. Numeric data from remote sources is captured as ASCII text, but the system will parse it back into "live" numbers when the user transfers it

displays pagination on demand. The original *Framework* had no spelling-checking capability.

The program now comes with two interactive tutorials—a beginning one and an advanced one. And the documentation now comes in five pieces instead of two. The system now occupies eight diskettes; installed on a hard disk, it occupies about 1 megabyte, according to Ashton-Tate.

The memory requirement, as for *Framework 1.1*, is 384K. According to Ashton-Tate, the amount of resident code is now larger but, because the system now creates smaller files, the user with a minimum configuration will still be able to do about as much as one could in *Framework 1.1*.

MultiMate Drops Just Write Price

Price cut is tied to demand for low-cost word processors.

BY JANE MINTZER

EAST HARTFORD, Conn.—Shortly after the recent unveiling of its low-cost *Just Write* word processor, MultiMate International has lowered the price of the program from \$245 to \$145.

This price drop comes soon after MicroPro's announcement of *Easy*, a \$150 word processor.

ing program. MicroPro, maker of *WordStar* and *WordStar 2000*, is aiming this product at first-time users.

Robert Obuch, MultiMate's senior vice president of sales and marketing, says that *Just Write*'s price reduction had nothing to do with the recently introduced MicroPro package but was instead a response to user demand.

Obuch says there will be no compensation or reimbursement to those who purchased *Just Write* word processing program at the higher price. ■

IBM Product Centers Sell Tecmar's Maestro

BY CHRISTOPHER JOHNSTON

SOLON, Ohio—What has a serial port with both 9- and 25-pin connectors, a printer port, one block of DIP switches, and a treasure chest of software? Tecmar's *Maestro AT* board. And now you can get that board at IBM Product Centers.

"We're pleased that IBM chose Tecmar for AT multi-function needs," said Tecmar president Marty Alpert.

Since the *Maestro* has both 9- and 25-pin connector ports, PC

peripherals such as a mouse or a Koala Pad can now be used on the AT without cumbersome cable interfaces.

The five available board configurations range from 128K bytes for \$589 to 2.5 megabytes for \$4,589. Three of the configurations will be featured at the Product Centers, with the other two memory options available through special orders. *Treasure Chest* software includes a database, a time-management system, a diagnostic routine, and extended RAMdisk and printer buffer software. ■

IBM Unveils New Modems And Printer

BY CHRISTOPHER JOHNSTON

ARMONK, N.Y.—IBM has expanded its line of hardware peripherals with the introduction of two communications devices and an addition to the Quietwriter printer series.

The IBM PC 1200 internal modem (\$499) and the 5841

1200 external modem (\$609) include transmission speed detection, line-equalization dial tones that minimize phone line distortions. Other features of the new modems are busy detection, ring-back and attention signals, self-diagnostics, automatic or manual dial, and automatic redial.

The Quietwriter Printer Model 2 (\$1,595) supports high-resolution graphics packages.

The new products are available through IBM Product Centers and authorized dealers. ■

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Ashton-Tate

dBase III 1.1	call
Framework 1.1	call

Best Programs

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Rosesoft

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Software Digest

Rating Newsletter

This publication is unparalleled for its comprehensive, reliable evaluations. 1985's issues evaluate the following programs: word processors, file mgt., database mgt., spreadsheets, graphics, integrated acctg., project mgt., communications, integrated productivity

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Year Subscription 185.00

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-----------------------	----

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Stone (requires graphics board)

My Letters, Numbers, Words (ages 1-5)	29
---------------------------------------	----

Kids Stuff (ages 3 to 8)	29
--------------------------	----

Across the U.S.A. (ages 5 and up)	22
-----------------------------------	----

GAMES

Microsoft

Flight Simulator 2.12 (now works on Hercules Mono Card)	32
---	----

Spectrum Holobyte

GATO	27
------	----

Sublogic

Night Mission Pinball	29
-----------------------	----

Jet	33
-----	----

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- Smartmodem 1200 399
- Smartmodem 1200B (w/Smartcom II) 369
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- Smartcom II 2.1 (software) 89.

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- Hercules Color Card (parallel port) 169.

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- PC Mouse with PC Paintbrush 2.8. special

key tronic

- Deluxe keyboard (KB 5151) 169

Kraft

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Maynard Electronics

- Floppy Drive Controller 119

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through October 31, 1985

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The Flight Stuff

FIRST LOOK

SubLOGIC's new flight simulator's great graphics and fast action may be at the expense of authenticity.

BY RICHARD AARONS

As with so many programs, how much you like SubLOGIC's new *Jet* flight and air-fight simulator will depend on your expectations.

Jet was put together by Bruce Artwick, the imaginative fellow who brought us Microsoft's *Flight Simulator* Versions 1 and 2. *Jet* purports to simulate two state-of-the-art jet fighters in dog-fight and ground-support missions.

Jet simulates two fast and maneuverable supersonic jet fighters, a land-based F-16 Fighting Falcon, or a carrier-based F-18 Hornet. The program includes a free-flight, noncombat mode and offers a variety of land/sea strike or dog-fight options to test the pilot's skills under different combat conditions.

The aircraft is equipped with a heads-up display (HUD) for monitoring instruments and the environment simultaneously. The display gives you a full-screen, out-the-window view. With its excellent aircraft control and ballistic performance, you get the kind of aerobically maneuverability only a modern jet fighter can provide. And either aircraft can be fitted with a variety of weapon types (air-to-air missiles, air-to-ground missiles, or smart bombs), depending on the mission selected.

Jet is compatible with all SubLOGIC scenery disks, incorporating its newest high-speed graphic drivers, and it introduces new scenery display concepts for improved on-screen viewing on monochrome or RGB monitors.

Okay, so much for the sales pitch. But is it really better, or even as good as, the original *Flight Simulator*? Or, perish the thought, is it merely an arcade program with nifty graphics?

No Plane, No Gain

The answers, I think, are found in the documentation as well as in the use of the product.

The flight-simulation nuts among us will remember that *Flight Simulator* was designed as a "second-generation, real-time flight simulation program for microcomputers." Microsoft provided 94 pages of documentation—half of them a representative *Aircraft Flight Manual (AFM)* and several navigation plates. The *Jet* documentation, on the other hand comprises 40 pages, almost all of them containing airy line

control of this type aircraft, is an angle-of-attack display.

Up from the Skies

Consider for a moment the ground-handling situation. Thrust (throttle setting) is calibrated in percent, as it is for real jets; however, ground/flight idle is at 0 percent in *Jet* rather than between 50 and 60 percent as it is for real aircraft. Also, the idling engines of a real jet provide a residual thrust that will move the airplane along taxi ways at a good clip once the airplane begins to move.

Jet has neither this idle thrust nor wheel brakes so the taxi simulation is crude at best. The airplanes fare a little better once aloft, but the simulation is sloppy at both ends of the flight envelope—that is, at the airport and at high altitudes and high machs.

SubLOGIC does keep its promise of improved high-speed graphics. Although eval-

uations, and in some cases, they use sidearm controllers. (A sidearm controller is like a microcomputer joystick mounted on the armrest of the pilot's chair). To the extent that *Jet* attempts to use both fly-by-wire and sidearm control, it demonstrates rather than simulates these concepts.

Shoot 'em Up

Where the heart of the *Flight Simulator* was in the aircraft and the task of flight management, the heart of *Jet* is in shooting stuff down or being shot down. Alas, it seems as if the arcade fans have beaten out the flight-simulation buffs for Artwick's attention.

So, putting it all together, it would seem that *Jet* is more get-the-alien than learn-to-fly. *Jet*'s graphics are better and faster than *Flight Simulator*'s; however, the airplane simulations don't hold a candle to Artwick's original effort.

I suspect the \$49 price tag and the fact that *Jet* can use SubLOGIC's scenery packages as well as the scenery files on *Flight Simulator* will help this product do well. And, for each flight simulation buff it disappoints, it'll pick up an arcade fan with its fast action and nifty graphics.



The aircraft carrier's control tower view of an F-18 Hornet launch.

drawings of various display elements. Actually, there is little need for complex discussions of real airplanes in the *Jet* manual because there is little attempt to let the user "fly" accurately simulated airplanes.

The user controls the craft's thrust, altitude, weapons firing, airbrake, landing-gear, and pilot eject. The HUD simulation gives only sketchy flight information—altitude, mach, g-loading, heading, and altitude, the latter on a log scale. Missing are engine-performance and rate instruments. Also missing, and especially critical to the

uating the quality of graphics is pretty subjective. *Jet*'s graphics are a full-order-of-magnitude improvement over Version 2 of *Flight Simulator*. RGB presentation, almost unusable with that program, is quite acceptable with *Jet*.

As is the case with *Flight Simulator*, *Jet* lets you select views (forward, left, right, and aft) and, in addition, enables you to use nine levels of magnification. The graphics representations of other aircraft, missiles, and targets are excellent.

Modern fighters are, for the most part, fly-by-wire ma-

Richard Aarons is a contributing editor of PC Magazine and a senior editor of *Business & Commercial Aviation* magazine, where he evaluates business-jet aircraft and the modern full-scale simulators used to train jet pilots. He also holds single- and multiengine instructor certificates in addition to advanced and instrument ground instructor ratings.

Jet

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(On a scale of 0 to 10.
For methodology,
see Page 68.)

OVERALL EVALUATION
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CIRCLE 140 ON READER SERVICE CARD

COMMUNIQUEs by CHARLES BERMANT



Monkey Business

Deep in the computer-dealer forest, ComputerLand has its competitors literally swinging from the trees according to "It's a Jungle Out There," a 4-minute promotional film that was shown to the chain's franchisees at its annual meeting.

Like Woody Allen's spy-spoof film, "What's Up Tiger Lily?" in which a Japanese thriller was overdubbed, the visuals for this feature were taken from an old Tarzan serial that has lapsed into public domain. The voice track, which features Fireside Theater's Philip Proctor, portrays the loinclothed crusader as an intrepid ComputerLand dealer

hacking through the retail brush. He encounters a witch doctor called Michael Shabazian, coincidentally the name of a top ComputerLand executive. Throughout, Tarzan is seen fighting off ferocious lions and panthers called Businessland and Entre and bellowing "ComputerLa-a-a-a-and!" whenever possible.

Although the film may be distributed to the individual stores, ComputerLand has no plans for wide release. "There are too many inside jokes," says one person involved with the film. "Who knows who the hell Michael Shabazian is?" Regarding his portrayal, Shabazian says, "My people put it together. I had to be in it."

If He Had Chosen Chinese Food, Would He Have Felt Like Rebooting an Hour Later?

Our non sequitur of the month award humbly goes to the editors of *The Wall Street Journal*. Part of a recent article on the Compaq computer company that ran in the business publication read, "[company president Rod] Canion, a former Texas

Instruments engineer, was thinking of opening a Mexican restaurant in 1981 when he realized that IBM had established the standard for personal computers with the introduction that year of its original PC model."

Getting to Know You

Tallgrass Technologies, the Overland, Kan., manufacturer of tape backup peripherals, scored a recent royal coup. Thailand's predominantly ceremonial royal family, which sure didn't have personal computers when Yul Brynner was in charge, has been using an IBM to keep track of its various good deeds on

behalf of the country's underprivileged people.

Tallgrass, with an aggressive international marketing campaign, had already placed its product in the country's state-owned IBM dealership. So when the Thai princess was doing so many good deeds that her hard disk overflowed and she felt the need for tape backup, Tallgrass was ready and waiting to save the day.



It's Not Our Policy To Comment on Recipes Under Development

From our new product file: Forrest Mims III, who helped write the world's first microcomputer manual for the original Altair, recently donated his prototype of that machine to the Smithsonian Institution and celebrated the occasion with a life-sized cake baked in that machine's image.

Although no digital-specific bakeries have opened as of yet, the possibilities for commemorative computer cakes will no doubt be big business, just as soon as the PC, Macintosh, and Data General/One come of age.

An AT cake could be baked with microscopic chips that allow it to be eaten and digested in half the time, while the PCjr would be commemorated with a Twinkie that would last a short time and then disappear.

Computer Helps Dog-Bite Victim

Heard anything unusual about PCs lately? We pay \$50 for each item accepted for *Communiqué*. Send your entries to PC Magazine, One Park Ave., New York, NY 10016; (212) 503-5276; MC1 Mail 157-9301. Do it now. Tomorrow could be too late.

Weird Science

One of the more volatile programs to explode on the market is Simon and Schuster's *Chem Lab*, a package that allows budding young Franksteins to create and experiment with a chemical world within their PCs. Bunsen burners, robot arms, and a variety of chemicals guide the kiddies through 50 different experiments, duplicating the chemical reactions of real life.

The program has a clear advantage over chemistry class. By creating a theoretical lab environment, one can mix various chemicals without the aggravating mess or restrictive cost of live chemical experiments. This is good news for those who opted out of the class because of an aversion to dishwashing and

lab fees. After making nitrous oxide and a synthetic diamond, however, it occurs to us that *Chem Lab* could have been a lot more fun if the makers had added a bit more risk. The most volatile chemical that can be created is nitroglycerine, and even that takes too much time. We know that plutonium is a heavily restricted substance, but a little theoretical radiation would have made it more interesting to adults.

Simon and Schuster, however, has made it clear that *Chem Lab* isn't to be misused by including a disclaimer. "You can do these experiments inside your computer," it warns. "But you should not try them with real chemicals. It is one thing to blow up a computer screen, and another to risk harming yourself and others in real life."

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PC UPDATE by VIRGINIA DUDEK

NEW YORK - Softronics Inc. of Colorado Springs, Colorado is offering an upgrade of **Softerm PC**, a communications and terminal-emulation program for the PC. Users of **Crosstalk XVI**, by Microstuf, Inc. of Roswell, Georgia, can upgrade to **Softerm PC** for \$50. "We feel we have the most comprehensive communications program," says president Tony Middleton. **Softerm** features 30 exact terminal emulations in one package and the ability to run concurrently with other software programs; i.e., performing file transfers while using **Lotus's 1-2-3**.

Softerm PC's terminal emulations provide all keyboard and display functions for both conversational and block-mode operation. The program supports concurrent operation of up to four serial ports (COM1-COM4) and three parallel ports (LPT1-LPT3), along with modular organization that includes separate modules for each type of personal computer, modem, and terminal emulation. Custom drivers are included for more than 20 modems to simplify auto-dial operation. **Softerm PC** also has instant "hotkey" access to communications and terminal emulation functions from any program if **Softerm PC** is installed in resident memory. To upgrade from **Crosstalk XVI** to **Softerm PC**, send \$50 and the original **Crosstalk** program disk to the Softronics office in Memphis, Tenn., (901) 683-6850. The offer runs until October 31, 1985. Softronics will return the **Crosstalk** disk with each order.

Lotus Development Corp. of Cambridge, Mass. announced the availability of \$75 upgrades to **Symphony** release 1.1 through January 31, 1986. Registered users will receive an upgrade kit from **Lotus** that contains a form that you return to **Lotus** along with the **Symphony** Help and Tutorial disks. Companies with 50 or more copies of **Symphony** can make special arrangements with **Lotus** sales reps for bulk upgrades. Users who purchased the

original version of **Symphony** on or after April 24, 1985 will receive free upgrades. Call (800) 872-3387 in the U.S. or (800) 447-4700 in Canada if you didn't receive an upgrade form from **Lotus**.

Sorcim/IUS of San Jose, Calif. announces **SuperCalc3 Release 2.1**, which can now use all 8 megabytes of memory on **Intel's** Above Board expanded memory board, as well as all compatible boards that meet the **Lotus/Intel** specifications, including **AST's Rampage!** expanded memory board. **SuperCalc3** also supports the **IBM 3279 PC**, the **IBM Enhanced Graphics Adapter** and graphics monitor, and the **IBM Jet Printer** and color printer. Release 2.1 includes **Sideways**, the printing program from **Funk Software** that prints reports horizontally. Updates are free on purchases made between June 15 and September 15, 1985. Otherwise there is a \$50 fee. Contact **Sorcim/IUS** in San Jose.

Short takes: **MonoGrafx Version 2.1**, a free-form graphics program from **Analytics International Inc.** of Arlington, Mass. now features different type sizes and text-editing capabilities. You can also create larger and more complex graphics than with previous versions. Free upgrades will be sent to registered users. Nonregistered users contact **Analytics International ... Summa Technologies** of Beaverton, Oregon released **Freestyle Version 1.5**. Text processing speed has been increased, and 1.5 now moves text 10 times faster than before and also moves large documents 50 times faster. Outline operation speeds were increased 500 percent. Site-license owners will receive free updates. Other registered users must pay \$50. Call Select at (415) 459-4003.

Be a contributor to PC Update. Write or call Virginia Dudek, PC Magazine, One Park Avenue, New York, NY 10016 (212) 503-5265.

Hewlett-Packard Lifts Off Its New LaserJet Family

The LaserJet Plus printer was designed with science in mind.

BY DARA PEARLMAN

BOISE, Idaho—Declaring its intention to produce a "family" of laser printers, **Hewlett-Packard** has released the **LaserJet Plus**, an enhanced version of its popular **LaserJet** printer. **Hewlett-Packard** priced the new printer at \$3,995 and dropped the price of the original **LaserJet** from \$3,495 to \$2,995.

According to **Bob Granger**, product marketing manager for the **LaserJet**, the **LaserJet Plus** is designed for scientists who print mathematical and scientific formulas and for people who mix a lot of text and graphics. To meet their needs, the **LaserJet Plus** allows the use of floppy-based fonts, which can include scientific character sets, and offers twice the graphics resolution of the original **LaserJet**. The

LaserJet Plus also includes built-in ruler lines and shading to aid in forms design.

Because of its expanded internal memory—519K, up from 79K in the original **LaserJet**—the **LaserJet Plus** can store up to 32 forms in its printer memory.

Granger said that a dozen independent software developers have already announced plans to support the enhanced features of the **LaserJet Plus**. The programs include **GEM Write** and **GEM Paint** from **Digital Research**, **Spellbinder Scientific** from **Lexisoft**, and **Word Image Processing**

from **Datascopy**.

Until the end of 1985, **Hewlett-Packard** will add the new features to existing **LaserJets** for \$1,495. Beginning in 1986, the upgrade price will be \$1,995.



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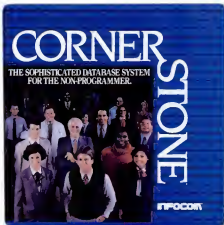
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*The New York Times quote from the May 5, 1985 issue.

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Grolier Electronic Unleashes Its Knowledge on a Compact ROM Disk

PRODUCT REVIEW

BY JAMES LANGDELL

NEW YORK—Grolier Electronic Publishing has fit the 9-million words of the *Academic American Encyclopedia*'s 30,000 articles and 21 volumes onto one 4.72-inch CD-ROM disk. This bold undertaking marks the first major PC product to use this new megastorage format.

Grolier has also put a word-level index and search-and-retrieval software on the same disk. All this data, however, consumes only 20 percent of the CD-ROM's capacity.

Wordplay

This encyclopedia-on-a-disk will be available in October at a price of \$199 in versions for the PC family of computers and the Atari 520ST. A special CD-ROM drive, not a typical audio CD unit, is needed to use the disk with a computer. Atari plans to offer such a drive this fall.

The encyclopedia is no stranger to digitization. The data in Grolier's encyclopedia has been available electronically through on-line database ser-



Grolier's 4.72-inch disk

requires 256K and a CD-ROM drive.

vices, including Dialog and CompuServe, for the past 3½ years. In fact, the on-line version is more up to date than the original printed volumes.

Grolier Electronic updates the on-line encyclopedia quarterly. The CD-ROM version will probably be revised annually, but Grolier has not yet set a policy for supplying upgrades to users.

Born to ROM

The main advantage of the CD-ROM version over printed

encyclopedias is its word search software. "This system exponentially increases the value of the database," said Frank Farrell, president of Grolier Electronic Publishing Inc.

By entering an entire list of words, you can track down a variety of articles. Or you can search for intricate cross references by specifying that the system select only articles in which certain combinations of words occur.

Even the most complicated searches require only about 30

seconds before the program displays a list of encyclopedia articles that meet your subject or title specifications. When the full text of these articles is displayed, the key words are highlighted.

Loose Associations

Key-word searching can lead to unexpected connections.

A search for "IBM" found a citation for an article that mentioned a fountain designed by Noguchi for IBM's Armonk headquarters.

A Manhattan-based publisher, Grolier developed the CD-ROM encyclopedia with the aid of Activature Corporation, a Monterey, Calif., firm started by Gary Kildall (head of Digital Research Inc. and inventor of the CP/M operating system) that specializes in data storage and retrieval from optical disks.

Farrell said Grolier plans to offer a series of enhancements over the next 2 years to make use of the untouched 80 million words of storage on its encyclopedia disk. A dictionary and thesaurus that are integrated with the encyclopedia are on the top of the list.

While the present electronic encyclopedia is text only, Grolier intends to include digitized illustrations in the future. "Even audio examples could be stored on the CD-ROM," claimed Farrell.

TRANSMISSIONS by CRAIG L. STARK

At least 60 percent of the files downloaded from PC-IRS are transmitted using the Xmodem transfer protocol, but a number of our callers seem to be having trouble with it. Several times a day I pass by the monitor and see the "Xmodem send ready" message. Frequently, some minutes later, I see the message "Receiver aborted transfer."

Oddly, the most common error is the simplest to avoid: When you tell PC-IRS the filename to download, you have to go back into your own software and tell it to open up a file on your computer to receive the download using the Xmodem protocol. This means typing the

The latest in listings and what's happening on PC Magazine's Interactive Reader Service

filename twice. Your computer not only will open its own file, but it will send PC-IRS the necessary code to tell us that you're ready.

Similarly, PC-IRS users often forget that the first time they get on the board (and were mildly confused at having to choose their own password) they registered to use ASCII rather than Xmodem. Later, when they get to the files menu and try to download they are told that they

must use Xmodem. You can't change formats at that point.

The answer is to go back to the main menu and type U (for Utilities). There, you can change your reception mode to Xmodem—assuming, of course, that your software supports it. If it doesn't, get some communications software that does: The new PC-IRS (which won't keep you waiting for minutes at a time while it checks that you are in our users file) re-

quires Xmodem transmission.

Thanks go to John Dickinson for putting together the complete 1984 and 1985 printer test results (with updated prices). These are downloadable as a 1-2-3 file called PCPRINTER.WKS. Type L:2 from the files menu for the directory information.

Also new on the board are the COM, ASM, and ASC (BAS-IC) files for Steven Holzer's DELZ program. (See this issue's Programming column.) If you really want to deep-six a file, DELZ is the way to do it.

In other words, don't change that autodial, keep it set to (212) 696-0360 for the best in PC programs and listings.

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Powell's Texture Turns PCs Into Music Machines

BY CHARLES BERMANT

NEW YORK—Roger Powell, sitting alone amid several synthesizers and a portable Compaq, is creating a sophisticated pop-funk sound. It's easy, as you know, to look like Madonna, and with this equipment—and Powell's own *Texture* "music processor"—it appears to be just as easy to sound like her entire band.

Powell, who is both a musician (he is a member of Todd

Rundgren's Utopia) and a programmer (he wrote every line of *Texture*'s code), is the first to admit that his program is no substitute for talent. (See "The 16-Bit Seduction of Roger Powell," *PC Magazine*, Volume 3 Number 6).

"You still have to have ideas," he says. "What you have now are power tools to make the job easier. It's more of a creative challenge, and it will free musicians from mundane processes. There is no guarantee that it will improve creativity or quality, but it will make people more productive and prolific."

The *Texture* program essentially treats music the way a word processor does text. You create a passage, then play and edit it to yield the desired result. You can manipulate the music, repeating a passage or inserting



Roger Powell's *Texture* messages music the same way word processors manipulate text.

it in a different place. The tempo can be sped up or slowed down, and keys can be changed. Furthermore, *Texture* can support up to eight tracks of recording and playback. Your musical sound, then, is limited only by your synthesizer budget.

Powell User

Powell hopes to sell the program to musicians and non-musicians alike: professionals, amateurs, hobbyists, and people who compose at home and want to hear how a new song

would sound with full orchestration.

One possible market for *Texture* could be musicians on the Holiday Inn-lounge circuit, who create ersatz versions of popular songs. "There are situations where that's okay," says Powell, "as background in a bar, where it is not essential that there be eight live performers. This way, one to three people can enhance what they do and can command a larger fee if they have a more filled-out sound."

Powell, who has been working with *Texture* publisher Cherry Lane Technologies for about a year, developed a PCjr music program in conjunction with Microsoft, which then had designs on the entertainment software field. "By the time the program was ready, it was too late," says Powell. "If I had finished 2 months earlier, I would have made it." However, he was able to save that project and translate much of his PCjr code into a program for the Commodore Amiga.

Part of *Texture*'s appeal, according to Powell, is the amount of exposure it can offer to nonmusicians, those who have always wanted to dabble in music or who are just looking for new PC applications.

"With this program, people can explore various fields of music at an early age and pursue their own talent," Powell says. "With the old way, you really had to go through a lot of hard knocks to find one area of interest."

Texture
Cherry Lane Technologies
P.O. Box 430
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(914) 937-8601
List Price: \$199
Requires: 128K RAM,
DOS 1.1 or later, Roland
MIDI interface and card.

Suresoft Connects Consumers with Phone Carrier Rates and Services

BY
FRANK J. DERFLER, JR.

WASHINGTON, D.C.—The choice of a long-distance carrier should be based on both the quality and the cost of service. Unfortunately, neither of these factors is easy to check. But a new program from Suresoft can make the job a little easier.

PC users who want the most talk for their money can use *Teledoll*, a low-cost, effective program that compares the costs of seven major long-distance carriers. *Teledoll* takes time of day, length of call, number of calls, locations called, speed of payment, and special bonus plans into account when figuring out long-distance service charges.

The program asks you for the

area code and exchange number you will call from and then allows you to enter an actual or typical series of calls. You can select from among 15 subscription plans offered by AT&T, ITT, GTE, MCI, SBS, Western Union, and Allnet.

The program provides a report showing each carrier's cost for specific calls and the total cost of calls according to the carrier. This report is useful for making spot comparisons among the services and for changing your calling patterns to develop low-cost routes for automatic dialers and data systems.

Teledoll seems immune to crashes, and it is full of prompts and descriptions. You can enter calls through the program's screens or through an ASCII file

created with an editor or word processor.

Since carriers change their rates (AT&T recently lowered prices and narrowed cost differences), Suresoft's \$8.50 program-update policy is particularly valuable. At \$29.95, *Teledoll* provides a sophisticated and inexpensive way to investigate long-distance costs. ■

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DOWNTIME BY WINN L. ROSCH

Hard Disk Upgrades: New Power for the XT



Not everybody has to solve high-order matrixes, manipulate high-resolution graphics in real time, or spreadsheet their way out of the Mexican economy. Most of the chores you pass off to your computers are more drone work than intellectual expeditions—jobs that call not so much for thinking speed as perseverance.

Even when your PC does all the repetitious calculations and thrill sorting, the job-related thrills of working on the machine run about as high as spending your Saturday night in the middle of an Iowa cornfield. Little wonder, then, that after you spend 5 minutes with your hands on an enhanced AT you become spoiled.

The experience is quite different, however, when you give a test spin to an AT without a high-performance hard disk under its hood. An AT equipped with only floppy disks performs like a Ferrari in rush-hour traffic. Envious heads may turn, but you'll still spend the whole time with one foot on the brake, never leaving first gear.

Set such an AT grinding through a database sort or the assembly of your latest programming opus and its performance will appall you. It won't even approach its promised five-times-faster-than-a-PC speed rating.

The Earth's CORE

According to Hal Prewitt, president of AT hard disk purveyor CORE International, a well-kept secret about the performance of the enhanced AT is the effect of its hard disk's speed—it's not just 20 times faster than a floppy but two to

three times faster than an ordinary hard disk like the XT's. Programs that require a lot of disk input and output benefit more from that fast disk than they do from the AT's 80286 processor. In fact, the instant response you get to your keystrokes on an AT is directly attributable to the 40-millisecond average access time of that disk and the sturdy replacement drives that come from CORE.

AT My Dust

Prewitt proves this point with some simple math. A personal computer can process on the order of 1 byte every microsecond. However, finding the next byte for processing at random on a disk, even on the fastest hard disk, takes somewhat longer—more than 10,000 times longer. While microprocessor speeds are measured in megahertz (millions of cycles per second), the principal figure for measuring hard disk speed is average access time, which is measured in milliseconds, or thousandths of a second.

The slowest hard disks on the market respond in about 110 milliseconds, the fastest in about 25 milliseconds. Although a few thousandths of a second seems like an utterly insignificant amount of time, you can actually see that tiny difference when you compute. In fact, a higher performance disk can actually cut the time taken for a disk-intensive task by a factor of 2 to 4.

Prewitt's point is that while an inexpensive hard disk with an average access time of 80 milliseconds or so will improve an AT's performance over no hard disk at all, to get all the per-

formance IBM designed into the machine, you need a high-performance Winchester.

The AT, however, is not the only computer that can benefit from a high-performance hard disk.

Power-user executives and engineers who demand the AT's muscle for compiling programs and business analyses may think they have left the lowly XT and PC trailing far behind choking on technological silicon dust. IBM's older machines, though, can be more competitive than you might think. Equip the IBM PC or XT with a high-performance hard disk (rather than the XT's factory-issue 100-millisecond sluggard), and the machines seem almost turbo-charged.

Snap-on Tool

The only problem is finding an XT-compatible high-performance hard disk. CORE concentrates on the AT, and most of the generally available mail-order hard disks, although good buys, rate slow on the speed scale. Few manufacturers offer high-performance products that you can slide into your PC or XT's drive slots.

However, Priam Corporation has developed a new series of high-performance hard disk drives aimed at filling the void in your XT (or AT). Its flagship model of the new InnerSpace series boasts both 60 megabytes of storage and an average access time among the highest in the industry—about 25 milliseconds on CORE International's disk test—actually a tad quicker than the quickest CORE disk.

You can directly replace the XT's full-height drive with the

Priam in about 10 minutes. You just pull out a couple of screws, swap the drives and all the cables, and screw everything back together. If you buy a new, diskless XT, Priam also has a model that includes a hard disk controller. After you make the addition, any of the Priam systems will boot directly from the new disk.

Only a turbo board can make so visible a difference in the performance of your computer. And if you use your machine for typical small business functions—bookkeeping, payroll, accounts receivable and payable, database or mailing list maintenance, and so on—the faster disk may improve the productivity of your system even more than the turbo board.

You also get the added convenience of keeping all your records in one place and never needing to waste your time looking for the floppy with all the "S through W" clients on it.

Amazingly, you can add 60 megabytes of storage and higher performance to your system for about the price of a turbo board alone, and you'll finally get a chance to cruise through computing far in excess of the old speed limit—without a worry about the disk police making chase.

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The Price Is (Sometimes) Right

Software pricing is a delicate and mysterious process. It's hard to determine a product's real worth in dollars and cents, except by letting the market do it for you.

There is a mythical right price for every product; the tough part is finding it. Some products are so good as to be nearly priceless, while others are so bad as to be worthless.

WordStar and the other popular word processors have probably saved corporate America more money than all of the management consultants combined. Who can put a dollar value on Lotus's *1-2-3*? It has helped (or forced) businesses to look at the way they spend money and allocate resources in a manner unequalled since the invention of double-entry bookkeeping.

On the other hand, *1-2-3* is probably the single largest contributor toward the overpricing of software. It all starts when a couple of bright programmer-entrepreneurs think of a newer or better way to do something. They develop their idea, build a prototype, and show their product to a few knowledgeable people, who give them encouragement. A friend who knows how to spell begins writing documentation.

Somewhere along the way, they realize that the product has real commercial potential. They could make millions. But they'll need millions to advertise it and get it into distribution. They're going to need some venture capital, and in order to get it, they're going to need a business plan.

Enter Lotus

The enterprising duo adjourns to the nearest IBM PC and fires up *1-2-3*. Thus begins anew the age-old quest for the almighty buck:

"Hmm, lessee. We'll set up monthly columns for 2 years . . . a good product

life span. Now for expenses. Disk copying, packaging, advertising. . . Hey, Harv, how much do you want to make?"

"Oh, I dunno, how about 75 thou? I'm not greedy."

"Okay. Uh, divide by 12, range copy,



Bill Machrone

worksheet global. . . . What do you think people will pay for this thing?"

"Uh, it'd be a killer in the marketplace at a hundred and a half, Teddy."

"Yeah. Do you still have those sales projections we worked up over at the donut shop?"

"Yup. Nothing the first 2 months—people want to make sure we're real. I figure 3,000 units the third month, 5,000 the fourth, then 9 thou after the magazine reviews kick in. . . . Say, where are you putting the clerical support and shipping and receiving to handle all this?"

"Right here with the tech support and marketing people. See how the number ramps up?"

"Okay, when do we turn profitable?"

"Just a minute. Uh, looks like we don't. At least not in 2 years."

"Yeah, that overhead's a killer. Better jack the price up to \$200."

"Okay, that looks a little better. But still nothing to get Mitch Kapor jealous."

"All right, take it to \$249. But we can't go any higher."

"Hey, that works out okay. Let me copy it out a few more years and see what it does. . . . Wow! look at that!"

"Yeah, now that's respectable. What was the name of that venture capital guy your sister used to date?"

Harv and Ted are off and running. We'll just have to wait and see what the marketplace eventually thinks of their product.

Things We've Seen

The gulf between price and perception can be enormous. *PC Magazine* sees most new products before they're unleashed on an unsuspecting world, and we often get the chance to comment on features, performance, competition, and of course, price.

For example, during Project: Database, our landmark review of 66 database management products, we saw one low-end product that was particularly attractive. While its file-handling facilities were definitely limited, it had some of the best screen-formatting capabilities we'd ever seen, some of which haven't yet been surpassed. It was, however, deficient in report writing.

By the end of the demonstration, we were very taken with its ease of use and special strengths and already saw the potential for improvements in Version 1.1.

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The demo completed, I sat back and said, "Wow, that's the best \$195 product I've ever seen."

The president and marketing manager exchanged hurried glances. "Uh, we were going to price it at \$395."

We spent the next half hour trying to talk them into a lower price, but it was futile. You know what happened next. The product came out, people liked its good features but didn't buy it. The company doesn't exist anymore.

Natural Pricing

Contributing editor Steve Manes has already determined that the natural price for software is \$4.95 (see Parity Check, *PC Magazine*, Volume 4 Number 8). That determination notwithstanding, I'm currently using a \$12,000 product that runs only on a PC and is worth every penny. Back in the bad-old days, when I was a consultant, I wrote and sold custom programs for more than that. Over the years, they've saved my old clients many times their cost.

On the other hand, two of the most useful programs presently on my machine, *Filefac* and *Dtree*, are from an IBM utility disk that costs less than \$25. If they're so useful, why doesn't IBM charge more for them? Probably because nobody would buy them. The interplay between price and a buyer's perception of the product's worth is as delicate as a hummingbird approaching a honeysuckle. People would rather do without a product than feel they were getting taken.

Borland International has certainly turned everyone's preconceptions about pricing upside down. More and more companies are examining the low-cost, high-volume alternative as they establish pricing. Not that price alone determines the success of a product. Borland's first challenge was to differentiate itself from a (now-defunct) company offering a notoriously buggy Pascal compiler for \$29.95.

When a company has multiple products, how important is pricing consistency? Not very, apparently. I defy anyone to explain Microsoft's pricing policies. *Word* costs \$375. *Chart* is \$250. *Multiplan* is \$195. *Windows* is \$99. So is the new QuickBASIC compiler. And the C compiler is \$395. What determines the

relative worth of one to another? Who knows?

The most innovative approach I've yet seen to pricing is that of the software manufacturer who introduced his prod-

uct at \$65. Each month he raised the price by \$10 until sales began to fall off. The marketplace determined that the product was worth \$95.

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Sideline™ does give you all of these features, plus almost everything else you could ever want in a sideways printing program, and it greatly simplifies page-length and "guelines" settings. And it's all controlled from a plain-english menu, with a few keystrokes, and all operable via command line from an AUTOEXEC.BAT file. The all-new Sideline includes:

Sideways printing

- Menu selection of 6 font sizes
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- Menu printer port selection
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Sideways custom font design

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Unlimited menu setting store & recall

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- Configuration file settings storage

Special features

- Typewriter output mode
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(Sideline is a trademark of Cof Software, Inc. Comparisons based on Sideways V1.2 purchased 2Apr1985.)

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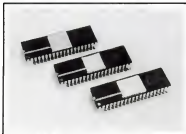
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Letters to PC Magazine

Keeping Version Numbers Straight

Your cover story on word processing has over a dozen references to *MultiMate 3.4* ("Word Processing: The Latest Word," *PC Magazine*, Volume 4 Number 17). There is no such product as *MultiMate 3.4*. I think your reviewers had a copy of *MultiMate Professional Word Processor*, Version 3.3. The incorrect version number has caused some



confusion among *MultiMate* users who read *PC Magazine*.

Bob Stepno
Multimate International Corp.
East Hartford, Connecticut

DOS Verification

I appreciated getting a copy of John Dickinson's BACopy program listing ("End Big Blue's Backup Blues," *PC Magazine*, Volume 4 Number 17). If it's not too much trouble, I would like to request an additional feature for it. Is it possible to install the DOS verify switch, such as the one that is found in the COPY command?

Tom R. Cardoso
Naperville, Illinois

John Dickinson replies:

That's an easy one. Whenever you issue the VERIFY ON command (from the DOS prompt), all data transferred to disk is checked to see that it can be read without error. That includes any application program you're running and certainly includes BACopy. To disable the verify option, you simply type VERIFY OFF.

Personal Unsung Heroes

Thank you for your feature article on the computer industry's unsung heroes ("In Praise of Unsung Heroes," *PC Magazine*, Volume 4 Number 16). I think your selections are sound, but there are many others that should have been mentioned.

I don't believe your unsung heroes are as unsung as unsung heroes could be. Being the project manager of a major microprocessor product at one of the world's largest semiconductor manufacturers can hardly be considered a closet job. The head of a small, successful software company does not go unnoticed either. While the technical achievements of these people are noteworthy, other equally influential contributions tend to go unwarded in today's cutthroat computer



market.

One of my unsung heroes is Gary Kidall. He and other folks at Digital Research laid the foundations for microcomputer operating systems with their pioneering work on CP/M.

Another unsung hero is Ward Christensen. He gets a big pat on the back for several contributions to public-domain software and distribution. Nearly every modem-based communication package for the IBM PC can use the Xmodem or Christensen protocol to transfer files. Christensen also did much of the early work on computerized bulletin boards.

I know there are many other bright and inventive people lurking in the background who are indirectly responsible for

many of the computer innovations that we enjoy today.

Karl W. Schultz
Hopewell Junction, New York

A Laughing Matter?

It is rare these days to find such a well-written and humorous article as Stephen Manes's Parity Check column in *PC News* on icons and the Macintosh ("Pushing Picture-Perfect Programs: Smash That Icon," *PC Magazine*, Volume 4 Number 12).

While keeping to the subject at all times, Manes manages to interweave a dry but very humorous computer room jargon with a lot of food for thought.

In the future, I shall avoid reading Manes's columns on subway trains, being all too sure that I'd happily travel a few stations too far before I finished the end of the column.

Magnus Wester
Stockholm, Sweden

Either Stephen Manes got up on the wrong side of the bed, or he ran out of things to say when he sat down and churned out four columns of useless diatribe on the subject of icons. I use a variety of machines in my work and find that the most efficient way to move around an application is to point and click. Icons are not panaceas, but even for expert users, they serve useful functions. For the uninformed or occasional user, they make the difference between doing something on a computer or not.

Does Manes really want to sound like a witless old geezer rapping his cane on the table in fury over people who have different ideas from his? I don't think so, but that's the way his column comes off. Worse, it's not even funny.

James Cortese
Boston, Massachusetts

Disk Hits

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CIRCLE 123 ON READER SERVICE CARD

LETTERS

mer: A Top Doubleheader," *PC Magazine*, Volume 4 Number 14, page 51). However, we are located in Milford, Connecticut, not New Milford.

An updated version of *The Baseball Statbook* is now available, and it has many new features, so that you can now keep multiple teams in one file and determine league standings.

Jim LoVerne
RJL Systems
Milford, Connecticut

Technical Interest

I was greatly interested in Mark Zachmann's PC Tutor column devoted to showing how IBM BASIC stores and handles floating-point integers (*PC Magazine*, Volume 4 Number 14).

At the end of the column, Zachmann says that if interest warrants, he'll go into more detail about the 8087 routines. I am interested. In fact, I'm going to subscribe to *PC Magazine* so I don't miss any of his columns. I hope Zachmann continues discussing 8087 routines.

Please keep up the technical columns such as PC Tutor, User-to-User, Spreadsheet Clinic, and Power User.

Eric E. Hanson
Ft. Polk, Louisiana

Fan Mail

I recently became a subscriber to *PC Magazine*, and I think it is a great magazine for PC users. I particularly like the columns by Peter Norton and Stephen Manes.

James R. Holcomb
Houma, Louisiana

Clearing Up

Your writers continue to erroneously use the term "bundling" in conjunction with the recent IBM XT promotion.

Bundling means customers must purchase products together. IBM had a 90-day promotion with its dealers to provide them with certain software packages. The dealers may choose to use the software in conjunction with promotional offerings. However, customers may buy IBM PCs and software separately.

James C. Reilly
IBM
Boca Raton, Florida

PC MAGAZINE • OCTOBER 15, 1985

LETTERS

The Big Shakeout

Your review of my book *The Coming Computer Industry Shakeout* was appropriate ("Hacker Heroes and Corporate Battles," *PC Magazine*, Volume 4 Number 15).

The book is obviously a little dated by now. Interestingly, many observers pointed out at the time it was written that I overdramatized the degree and extent of the forthcoming shakeout. Now, in hindsight, these same readers seem to agree that I was not vocal enough in the forewarning of the industry upheaval that has occurred.

Stephen T. McClellan
New York, New York

Smart Software

I was amused by Jared Taylor's reply to Bruce Bassin in *Spreadsheet Clinic* ("Fixing Circular Errors in 1-2-3," *PC Magazine*, Volume 4 Number 14). Taylor says "Since 1-2-3 is smart enough to know a circular error when it sees one, you'd think it would be smart enough to highlight it for you, too."

Back during one of my prior lives as a COBOL programmer, I remember making similar comments in this regard: If the compiler is smart enough to know that you left out a period at the end of a statement, why doesn't it just insert it and proceed on its way?

We'll all just have to be patient. User interfaces are still at a stage where you have to be thankful to get an error message at all, let alone one that's somewhat intelligible. Almost certainly, as PC software continues to mature and artificial intelligence techniques are incorporated, we'll begin to see "error information" (not just an error message) that is truly useful to the user.

In the meantime, I advise clients to be vigilant in their search for add-on products that pick up the slack. Fortunately, software is emerging that will peruse a spreadsheet and highlight the cells that contribute to circular errors.

Naomi Karten
Randolph, Massachusetts

Document Aid for Omnitel

After reading your interesting article on the Omnitel internal modem, (Omnitel's



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LETTERS

Encore Performance, *PC Magazine*, Volume 4 Issue 11, I purchased the Model T1200-PC1. I am extremely pleased with the unit's performance and am equally pleased with the support and personal attention I have received from Omnitel since I bought it.

As you stated, both Omnitel and Crosstalk's documentation leave much to be desired. Omnitel is not very clear about the DIP switch settings or jumper locations, while Crosstalk believes everyone will memorize its manual prior to use. For example, the program is supplied on two disks, but at no point is there mention of either one or how each works with the other: It was a nightmare. After hours (and I emphasize hours) of reading and frustrating experimentation, we were finally able to make the modem work.

As a result of this intense involvement, we've formulated an outline of the Omnitel unit's installation and use. We would be very pleased to make this available to any of your readers at no charge. Anyone interested should simply send a stamped, self-addressed envelope to us at Dynamic Acoustics, P.O. Box 646, San Ramon, CA 94583, and we'll send you a copy of the outline. We've also sent a copy to Omnitel. In our opinion, it would help their sales substantially were they to include a copy with each modem.

Gregory A. Calo
San Ramon, California

Correction:

Andrew Fluegelman's name was misspelled in "PC Pioneer Presumed Dead," *PC Magazine*, Volume 4 Number 19, page 35.

How to Write to PC Magazine

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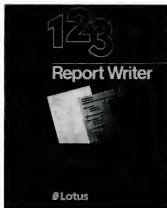
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A Penny Here, A Penny There

Sometimes when you scrimp on hardware, you're only stealing from yourself by diminishing your computing power. Norton lets you know where in your system you can safely save money.

If the theme of this issue of *PC Magazine* is low-budget PC systems, I have to hang my head in shame.

I'm generally excited about whatever is the latest and greatest in personal computers and add-ons (as shown by the amount of time I've spent talking about the hot but expensive AT and gushing about the glories of the fabulous but extravagant Hewlett-Packard LaserJet). These products are exciting to work with and fascinating to write about, but you can't always dish out the money for these goodies. So it's time for me to shift my focus to the economic aspects of personal computing. Occasionally I've heard complaints that I devote too much time to talking about the high end of the PC family. What people want me to give more coverage to are things like the PCjr.

This is ironic because I've probably devoted more time to writing about and promoting the Junior than just about anyone else. And, as I confessed when I discussed my ideas on an ideal PC system, for a very long time I treated my own hardware configuration as a low-budget affair.

However, I learned that scrimping was a really dumb idea. One of my most important discoveries was that I truly short-changed my computing work by being a penny-pincher. That remark might not be in keeping with our theme here, but consider it contrapuntal.

Getting Off Color

Of course, saving money is a noble cause, and there are some parts of your computer system that won't suffer from scrimping. I think avoiding color is a good way to save money on your PC sys-

tem; few people really need or can use color, and a color system that's good enough to really work well doesn't come cheap. On the other hand, don't use a color/graphics board and a composite monochrome monitor for your display



Peter Norton

just to save some cash. The loss in display quality and eye-cue isn't worth the savings.

Another way you can save money painlessly is to not go integrated. Don't buy multifunction items. That might surprise you a bit, but let me give you two examples.

You can buy some printers with built-in print-buffering memory, such as the Daisywriter. On the other hand, you can buy separate print buffers, such as the Microfazer. If you buy a Daisywriter loaded with buffer memory, when you move on to another printer you lose that buffer. Were you to invest in a Microfazer in the first place, you could use it easily with the new printer.

Another example: An internal modem combined with a communications line on one board sounds like a good deal. But an external modem can be easily used with other computers. So, be careful when you buy any kind of hardware combination package. The fact that you can't separate the pieces later can end up increasing your hardware costs.

Saving on Software

You can find terrific software bargains if you hunt either in user-group libraries or, better yet, among the established freeware/shareware vendors. You can find great stuff in these places, but there are some problems as well. Free programs rarely have the depth of coverage, updating, and support that commercial products have. On the other hand, the best-known and most established freeware/shareware vendors have some great programs that are responsibly supported. Four programs deserve special mention. The uncrowned king of freeware, Jim Button, gave up a long career at IBM to sell the bargain PC programs *PC-File* and *PC-Calc*. Andrew Fluegelman, who coined the term *freeware*, developed the excellent *PC-File* program. And Bob Wallace, creator of the Microsoft Pascal compiler, added *PC-Write* to the freeware arsenal. Despite the reputations of these fine programs, there is still a risk in buying cheap software. You can box yourself in with nonstandard data formats and have nowhere to go when you need to proceed further.

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today-sorry-tomorrow bargains, the money-saver par excellence in PC hardware has to be the rapidly fading PCjr. Word has it that street prices for Juniors are approaching \$300, and some wise guys are saying they expect to see the machines being sold on street corners next to umbrellas and imitation Gucci bags.

You may be running a risk if you buy a PCjr, but, on the other hand, it's a heck of a bargain in personal computing. A PCjr delivers roughly 75 percent of the raw computing power of a standard PC, and if your needs aren't heavy duty, that's not a bad deal. A lot can be said against the machine—it can't be expanded as conveniently as a PC can, the keyboard is crummy (even the new one), many important programs don't run on it, it's been virtually abandoned by major software and hardware makers—but the truth is the PCjr still has a few things go-

You may be running a risk if you buy a PCjr, but, on the other hand, it's a heck of a bargain in personal computing.

ing for it: a small footprint (it takes up a lot less of your desk than a PC) as well as that nifty wireless infra-red link between the keyboard and the system unit.

Switching to Super Screens

On another topic, a couple of issues back I sang the praises of the *SetHP* program from Orbit Enterprises—the best I've seen so far of the new crop of utility programs that service the HP LaserJet. Part of what I liked about *SetHP*—besides good, convenient functioning—was that it had just the right amount of snappy screen magic to make it fun to use. The author of *SetHP*, Joe Beda, dropped me a note letting me know that credit for the good screen work belongs to Glen Boyd of WindowSoft (21606 Criptana, Mission Viejo, CA 92692). WindowSoft distributes its extra-spiffy screen programs to software developers under the shareware concept. That should make the programs affordable to

lots of programmers who want hot screen action but can't afford some of the higher-priced subroutine libraries that are being sold. Programmers should definitely check out WindowSoft; this program

really looks good.

Testing the Speed Limits

Another bit of follow-up concerns the now-famous Doran test, put together by

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Joseph Doran. The Doran test uses a couple of the programs in my *Norton Utilities* to measure the performance speed of hard disk systems. It's a crude test, the sort of thing that engineers will tend to sneer at, but it's a simple and direct way for an ordinary user to get a measure of the effective speed of a disk (any disk, in fact—hard disks, floppies, RAMdisks, whatever).

The Doran test is simple. First you use the DOS program CHKDSK to measure the total size, in bytes, of a disk. CHKDSK lists a bunch of numbers, and you're interested in the first one—the total disk size (or, for a hard disk, the partition size). Next, you run my DT-DiskTest program, with the /D option, so that it reads the entire disk. You time how long that takes (with a watch or with my TM-TimeMark stopwatch program). Then you divide the CHKDSK disk size by the time DT took to run to get a speed rating of the disk.

Recently, Joe Doran sent me some current figures from several tests he did. To make the figures easier to understand, he scaled everything in relation to a stock XT hard disk. He found some surprising results, which you can use to help you make some price/performance decisions for any disk you are considering.

What the Tests Indicated

Joe found that some 20-megabyte disks that are being added to PCs and XTs performed rather slowly. The worst of the lot was a MicroScience disk that had a speed index of a mere .76 (compared with a stock XT speed of 1.0). The Bernoulli Box from IOMEGA, which you wouldn't expect to be particularly fast since it's a removable cartridge and not a fixed disk—measures in nicely at 1.5, nearly as good as the stock AT's hard disk, which does about 1.6. The best performer in Joe's new crop is the IDEA type 13 disk (it's a 20-megabyte disk for the AT, but one that's "shaped" differently than the AT's standard type-2 20-megabyte disk); this little screamer clocked in at 1.8.

Conclusion

While the nuances of hard disk speed won't really matter to many PC users, the

range of speeds that Joe encountered—from a low of .75 to a high of 1.8—suggests that there are some very real differences in this area. So if speed does matter to you, try using the Doran test. The ref-

erence point that defines a 1.0 speed is 44 kilobytes per second. A normal double-sided diskette clocks in on the Doran test at 4K bytes per second or .09 compared with a PC-XT's hard disk. ■

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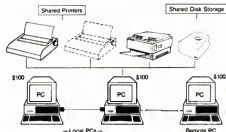
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communications and printing. All EasyLAN

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Printer sharing operates transparently with existing programs. Print files are automatically written to disk and scheduled for printing. Multiple printers per PC may be designated for specific office tasks.

For example, one PC can interface with Printer 1 for general purpose output, with Printer 2 for continuous-form letterhead stationery, and with Printer 3 for printing continuous-form invoices.

Disk sharing uses EasyLAN's COPY command, EDCOPY,™ to move files to and from PCs. Files are stored or retrieved from disk storage and the Directory is updated. The high-capacity benefits of just one hard disk can now be shared by several PCs.

All communication operations are protected by a unique password assigned to each PC so security is maintained.

EASY SPECIFICATIONS

Each PC in the network requires an individual copy of the EasyLAN software, 128k of memory, a serial communication port(s), and DOS 2.0 or above. For your convenience, EasyLAN diskettes are not copy protected. EasyLAN runs on all IBM PC models (PC, XT, AT, and Jr) and compatible PCs.

"I look for those products that make my job easier and save me and my company money. I believe EasyLAN does both."
—Carl Warren,
Editor, Mini-Micro Systems

EASY TO INSTALL

EasyLAN can be installed in less time than it takes to enjoy your coffee break. Just plug the EasyLAN cables into existing serial ports. EasyLAN's PRINT, COPY and DIRECTORY commands are very similar to DOS commands.

EASY TO ORDER

EasyLAN is immediately available and easy to order. For a two PC network, start with the EasyLAN Kit. For each additional PC in the network, order the EasyLAN Expansion Kit.

The EasyLAN Kits include program diskettes, manuals and cables, which are shielded to maintain signal quality. All parts are warranted for one year. EasyLAN program diskettes may be purchased individually; you supply your own cables, modem links or PBX connections.

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NETWORK NEWS

Vol. 1, No. 2

A GUIDE TO THE PROMISED LAN®

Oct. 15, 1985

PROLAN Starter Kit A Complete Network For Only \$1795

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Now Professional Local Area Networking is easier than ever. With PROLAN's starter kit, you can network your IBM XT or AT to a PC for only \$1795. And the Starter Kit comes complete: including 2 Network Interface Cards, 50 feet of RG62 Coaxial Cable with connectors, System Manager Documentation, 2 User Manuals, and PROLAN 2.0 Network Software.

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tween workstations, or around the world! And PROLAN has all the special features you expect in a professional network. Like file sharing, record locking, disk and memory caching, hard disk and printer management and three types of password protection at two levels.

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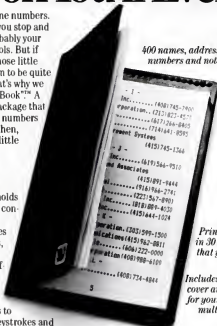
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MOM Introduces New Expert Business Software

By Elizabeth Addison

The MOM Corporation, specialist in Micro to Mainframe and Gateway communications has announced a new knowledge based version of QTIME software system to focus on business applications.

ATTLANTA, GA—The MOM Corporation, specialist in Micro to Mainframe and Gateway communications has announced a new knowledge based version of QTIME software system to focus on business applications. "The real benefit of expert software systems is PC user productivity," announced Mike Jones, President of the MOM Corp. "We see vast numbers of corporate PCs not being used because most PC users are not computer experts. There simply aren't enough programmers in most organizations to support increasing PC users' demands. The result is DP backlog and user inefficiency."

To address end-user and computer expert needs alike, the MOM Corp. announces QTIME, an expert system in the knowledge based system software category. QTIME is an extensive set of pre-compiled programs designed by experts. These pre-compiled programs reside on the computer's disk and allow non-technical PC users to transparently design applications tailored to individual needs.

A key feature of The QTIME Expert Software Business System is transportability which means applications designed on the PC level are transportable to the other Mini and Mainframe hardware levels.

The MOM Corp. also offers a series of training seminars for computer users and managers at all levels of expertise. One seminar in the series, aptly named T.H.I.N.K.S. (Training Help In New Knowledge Based Software) teaches computer users about technology associated with knowledge based business software systems. The MOM seminars emphasize increased use of computers in decision-making tasks using expert software systems in business and government applications.

The following excerpt is taken from MOM's GLOSSARY OF PC KNOWLEDGE BASED SYSTEMS.

Mom's Knowledge Based Software Definition Chart

This chart represents new terminology used in defining the artificial intelligence of knowledge based software. Such software provides non-programmers immediate PC business and government applications.

1. Expert Software Systems* are computer programs that perform tasks normally

performed by human experts. A novice can access problem specific information to more effectively manage and perform tasks.

2. Knowledge Based Software is the control structure which supports the expert system. The knowledge based software is used to manipulate information to form or infer conclusions.

3. Knowledge Engineering is the work of information experts to translate human expertise into computer workable solutions.

4. Knowledge Based Business Software is software focused on Business Information Management. The most widely used knowledge based systems have been in engineering and military applications. Usage of knowledge based systems is expanding to other vertical markets such as business, which involve situation and information specific data.

5. User Transparency means the computer user is not aware of how a computer task is accomplished any more than he is involved in programming the computer to accomplish that task. User transparency is the result of advanced work by expert computer programmers enhancing PC productivity and PC management.

6. Pre-Compiled Programs are extensive computer applications compiled into software modules which reside on the computer's disk. The non-technical PC user instructs the computer in English to call-up these pre-compiled programs and easily design applications tailored to individual needs.

7. Expert Software Shells are pre-compiled programs combined to form software modules. These software shells, designed by experts, serve as the form and foundation for transparent application design by PC users.

8. Smart Levels allow the computer user varying levels of application sophistication (smart levels) based on the user's expertise. Users can select increasing smart levels as software expertise develops.

9. Data Base Analysis is accomplished by calling up pre-compiled programs residing in the PC to capture data base information and transparently analyze it into histories, spread sheets, and printer graphics forms.

10. Built-In Editor eliminates the need for a separate text editor software package and allows users to make additions, changes and deletions to expert software shells.

11. Built-In Data Dictionary provides the user transparent data entry forms, transparent file handling and transparent report forms.

12. Cloning allows the user to copy parts of records or whole records without re-entering data and rearrange or transfer that data for use with other related applications or to share information with other PC users.

13. Data Pull accesses data files or parts of data files and transparently pulls and reformats them for use in query, history or report analysis.

14. Self Documentation is the automated process of documenting a system. This automation results from the Expert System's transparent picture-taking and appending features which automatically print and document applications.

*Note to Computer Managers: QTIME is an Expert Business Software System designed by computer experts to increase user productivity. The varying smart levels of software allow computer experts to attain higher levels of design applications while simplifying the job of assisting non-technical users.

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SYSTEM 36, IBM 43XX, 30XX and a UNIX version to be released in fourth quarter, 1985.

For more information on QTIME or the MOM Seminar Series, contact Elizabeth Addison, VP Marketing or Catherine Renaud, VP Software Applications, toll free: 800-241-1170 or 404-351-2902, or write The MOM Corp., Two Northside 75, Atlanta, GA 30318. In California: 12377 Lewis St., Garden Grove, CA 92640; 714-740-0303, 800-445-5773. In Illinois: 100 Tri-State International, Lincolnshire, IL 60015; 312-940-0700.

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- 16) Prints Budget Comparison
- 17) Income Statement and Balance Sheet comparing Actual vs. Budget with variances and ratios.
- 18) Prints Trial Balance and Chart
- 19) of Accounts
- 20) Prior Period Adjusting Entries do not impact current results.
- 21) Data Entry screen displays beginning, current and ending balances as well as the last 10 entries.
- 22) System allows new accounts to be created during data entry.

Accounts Payable

- 23) Provides for entry, updating and deletion of vendor information.
- 24) Allows entry, editing and posting
- 25) of payables, adjustments, cancellations and prepaids.
- 26) Prints the Open Item & Cash
- 27) Requirements reports.
- 28) Allows partial payments.
- 29) Prints A/P checks
- 30) Prints Check register.
- 31) Prints the A/P distributions to the General Ledger
- 32) Prints the vendor analysis report.
- 33) Interfaces to MCBS' General Ledger or may stand alone.

Accounts Receivable

- 34) Provides for entry, updating and deletion of customer information
- 35) Allows entry, editing and posting of receivables, credit memos, cash payments.
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Mass Storage for the More Perfect PC

What will the "more perfect" PC of 1988 feature?

The big news will be some form of optical memory.

The final installment of this two-part series examines different types of mass storage and when they'll be available.

Forward-thinking users are already speculating about the improvements in mass storage that the next generation of PCs will bring. By early 1988, the 3½-inch floppy may be standard—but how much data will it hold? Will manufacturers standardize the hard disk at 5¼ or 3½ inches? What will its storage capacity be? And are virtual memory and optical storage just around the corner?

This article—the second of a two-part series, describes the mass-storage alternatives that will be available for the "more perfect" PC, selling for \$3,000 in 1988. Its standard features will include the powerful Intel 80286 microprocessor, an IBM Extended Graphics Adapter (EGA) and bit-mapped display, a mouse pointing device, and as many as 10 megabytes of RAM.

Outguessing IBM

IBM currently uses two different 5¼-inch floppy disks: 360K-byte drives on the PC and XT, and 1.2-megabyte drives for the AT. If IBM decides to offer a portable "notebook" computer, 3½-inch floppies will be the probable choice because of size and weight considerations. Using the smaller disks will force IBM to supply an optional 3½-inch drive for regular PCs so that users can interchange data and programs between the two. And once IBM markets an add-on 3½-inch drive for the installed base of PCs and ATs, the company is free to switch to 3½-inch disks for future personal computers.

Will IBM install 3½-inch drives on its

desktop models? Raymond C. Freeman, president of Freeman Associates, a consulting firm that specializes in the data storage market, thinks so. In a few years, he believes, 3½-inch floppy and hard disks will be widely used in personal computers: A PC could sport a 3½-inch



Ron Jeffries

floppy with a capacity of 3.2 megabytes by 1988 and as much as 5 megabytes by 1990.

But not everyone is convinced that IBM and other manufacturers will switch to 3½-inch drives for their future desktop computers. Bob Katzive, vice president of Disk/Trend Inc. in Los Altos, California, is another analyst who tracks the disk-drive market. He is skeptical about whether IBM, for one, will adopt the 3½-inch format by 1988. According to Katzive, the footprint of a desktop machine—smaller with a 3½-inch drive—is not a compelling issue. He predicts that

IBM will install 3½-inch drives in its portable but will continue to use 5¼-inch floppy and hard disks in its desktop models. By 1988, Katzive expects a capacity of about 3 megabytes on the 5¼-inch floppy and 1 or 2 megabytes on the 3½-inch disk.

Hard disks for your \$3,000 computer in 1988 will also have a greater capacity than current ones. Freeman thinks a 30- to 40-megabyte 3½-inch drive will be cheap enough to be included. On the other hand, Katzive thinks that 20 megabytes is more likely for a single-user system and suggests that it might still be a 5¼-inch drive, although a 3½-inch drive is possible. He argues that most people don't really need more than 20 megabytes and that past that capacity backup becomes a problem. Although the AT has shown that a 1.2-megabyte disk can be used for backup, Katzive points out that the process is tedious.

The most conservative prediction for a 1988 PC forgoes a 20-megabyte 5¼- or 3½-inch hard disk in place of the 10-megabyte disk in today's XT. By then the drive will cost so little that a nonhard-disk PC may not even be offered.

Virtual Memory

With current cost trends, this "Winchester in every computer" assumption seems like a safe bet, since the differential in price between a floppy-only PC versus one with a hard disk could be as little as \$250. If a fast hard disk is always included, a revised DOS might support virtual memory.

Virtual memory, a technique used on

mainframe computers for many years, allows a program to be larger than the physical memory available. This seemingly impossible dream is practical because at any given time, only a small section of a given program is actually being executed. As long as this "working set" fits comfortably in real memory, the program will work fine. When you need part of a program that isn't in real memory, the operating system and special support hardware load the required code from disk into memory locations that are not being actively used.

Virtual memory, a technique used on mainframes for many years, allows a program to be larger than the physical memory available.

Ironically, virtual memory works best with a system that already has a large amount of real memory—otherwise the computer spends much of its time "thrashing" as it constantly tries to grab new sections of the program from disk. The large amount of RAM in your 1988 computer will be one of the things that makes virtual memory practical, but virtual memory also requires several other capabilities that are not available in today's standard PC.

Fast Access

First, for adequate performance, virtual memory needs fast average disk access—at least as fast as the 40 milliseconds the AT drive has, and the faster the better. Second, the processor has to be able to handle the program's requests for memory addresses that are outside the range of the physically installed RAM. The new 80286 chip used in the PC AT, which the more perfect PC will have, already has this capability. Finally, the operating system has to be a lot more complex if it is to support virtual memory. IBM has such an operating system—the VM/370—on some of its mainframes and has adapted it for both the AT/370 and XT/370 personal computers, al-

though these latter products have not sold very well so far.

By 1988, your standard \$3,000 PC could include some form of optical disk in addition to the standard floppy and hard disks. CD ROMs, for instance, described in "The Gigabyte Age" (Volume 4 Number 17), are high-capacity 550-megabyte read-only disks. They may be cheap enough by 1988 to be a standard part of the system, or at least a low-cost option. The only pertinent question that needs to be addressed is how long will it take vendors to adapt to the format and publish enough software titles to make CD ROM a truly attractive alternative.

Write-Once Disks

Write-once optical disks are another interesting mass storage option. Early evaluation units from Information Storage Inc. and Optotech have capacities of 100 to 200 megabytes. Although write-once disks are not erasable and have access times that are considerably slower than hard disks, they are removable, giving you access to an almost unlimited amount of data. If costs come down significantly, write-once optical disks might become a popular add-on for your 1988 PC.

But write-once disks will have some tough competition. Verbatim and Kodak have recently shown prototypes of a 3½-inch magneto-optical drive. This technology is erasable and stores over 40 megabytes on a single removable cartridge. By taking advantage of the change in polarization that occurs when light passes through a spot that is magnetized, this "optically assisted" form of magnetic storage combines some of the best features of magnetic and optical technology. Since at the present time it is still only at the prototype stage, the Verbatim drive probably won't be ready for the more perfect PC of 1988. But when it is, watch out! Although slower than a hard disk, magneto-optical storage is much faster than a floppy, has a high capacity, and is removable. By 1990, it could be an important mass storage technology.

Stretched Disks

The stretched disk, a novel form of

disk storage developed by 3M, combines Winchester capacity with the low media cost and removability of a floppy. According to David Cross, product manager of 3M, stretched disks should have a capacity of 20 megabytes by 1988 at a per-cartridge cost of \$25 or less.

The concept is a simple one: A plastic disk with a slightly raised ridge at the outer edge and around the center hub supports a thin polyester film coated with a magnetic oxide. The film is stretched between the two raised hubs; then it is bonded into place. Since the recording

The stretched disk, a novel form of disk storage, combines Winchester capacity with the low media cost and removability of a floppy.

surface is raised about 10-thousandths of an inch above the hard plastic support, it is flexible and, therefore, very forgiving of physical shocks incurred while the disk is in operation. The magnetic head forms a slight "dimple" in the film, but still floats about 4-millionths of an inch above the magnetic surface. According to both Freeman and Katzive, the 3M stretched disk looks like a promising new mass storage candidate. However, no major computer manufacturer has yet decided to use this new disk in its machines so far.

What Price Perfect?

The more perfect PC of 1988 will have more of everything that you can find on the standard microcomputer now, but at about the same price. The only really new mass storage technology likely by then is some form of optical disk. However, with a 286 chip, an EGA display, a mouse, more megabytes of RAM, a new operating system supporting some form of virtual memory, and higher-capacity floppy and hard disks, it will be a very powerful personal computer indeed. Just as soon as this "more perfect" PC comes on the market, I'm ready to write my check.



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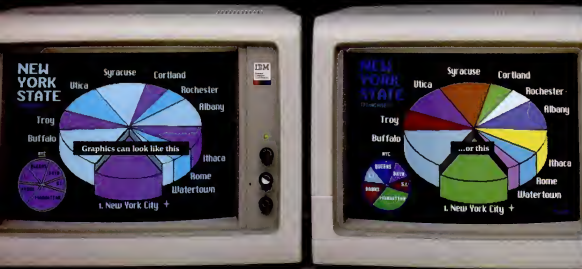
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Expressions of Change

Communication by computer stimulates self-expression, says a recent Carnegie-Mellon study. Not bound by the norms of group interaction, users are impulsive, more aggressive, and slow to come to a consensus.

How do computers change the way we think and behave? A deceptively simple and straightforward question, it goes straight to the heart of our relationship with one of the most important technologies of our time. Considering both the prevalence of computers and the vastness of the computer industry, you'd think that any major library would be full of studies—technological impact statements, so to speak—on this very question. Enough time and money has certainly been spent on such work: the automatic electronic digital computer was invented in the late 1940s, and many organizations, particularly the National Science Foundation, have financed research on the social and psychological impact of technology. So it was with a strong sense of anticipation that I rummaged through the library of Stanford University, where I teach, looking for the answer.

The Long and Winding Search

Much to my surprise, I found only one behavioral study that sheds much light on the question. By behavioral study I mean the kind of research that involves subjects using computers under carefully constructed and controlled conditions. Of course, many studies have been done on the economic costs and benefits of computers, mostly conducted by computer manufacturers and consulting firms; essentially advertisements for the computer industry, they don't address the issue at hand. And I found hundreds of impressionistic and anecdotal essays on the question: just about every anthology on computer technology includes a chapter on the impact of computers, of-

ten written by a notable computer scientist. Unfortunately, most of these essays are just so much hot air.

Why so few behavioral studies have been conducted over the years is an interesting matter. Most computer science de-



Stan Augarten

partments are much too dedicated to advancing the technology itself to bother about its social and psychological side effects. That's a typically American attitude, of course; the implication is that technology is an utterly neutral thing, its influence depending entirely on the way it's employed.

As for the sociologists and psychologists, few of them know much about computers, and fewer still care about the machines. But they know a great deal about conducting behavioral experiments, and they know that any study on the impact of computers must first solve a host of very thorny procedural problems. For example: How do you devise an experiment that separates the medium

(the computer) from its message (its content)? How do you decide what hardware and software to use and in what ways? How do you prevent the surrounding environment, or social context, from unduly influencing the course of your study? And how do you eliminate the biases in your approach? Every social scientist has preconceived notions about technology and the way to study it, but he must try to keep those prejudices at arm's length.

Network Communications

The one and only behavioral study I managed to find took place last year in Pittsburgh at Carnegie-Mellon University, one of the most heavily computerized schools in the country. Three psychologists—Sara Kiesler, Jane Siegel, and Timothy W. McGuire—sought to determine the social and psychological impact of computer-mediated communication (communication via a computer network). They organized their subjects (Carnegie-Mellon students) into three-person groups and presented each group with a "choice-dilemma" problem—a hypothetical quandary that required a group decision. Each group had to wrestle with the problem in three different ways: face to face; at computer terminals, physically separated from one another and not knowing which member of the group was doing the talking; and a second time at the terminals, still physically separated from one another but this time knowing who was doing the talking. The computer employed a program called *Converse*, which divided the screens into several parts and enabled all messages to appear simultaneously and to be scrolled independently.

The study had four dependent variables: the level of participation (who did the talking and how much of it); communications efficiency (how much time it took to reach an agreement, the number of remarks exchanged by the groups, and the percentage of remarks about the problem); interpersonal behavior (the degree of politeness in the discussions); and group choice (the depth and breadth of opinion).

The Findings

Kiesler and her associates are experienced computer users, so they came up

Computer-mediated discussions were relatively uninhibited. People were far more likely to curse their colleagues on the machine than in person.

with some fairly accurate predictions of the results. For example, they hypothesized that the computer-mediated groups would have a harder time forging a consensus in large part because the level of participation in these groups would be higher. If you're a heavy user of computers and at all aware of the way the machines affect you, then you probably won't be surprised by the findings:

- On the level of participation: Sure enough, the computer-mediated discussions were more egalitarian and the level of participation was higher.
- On communications efficiency: It took more time to forge a consensus via computer. Yet these computer-mediated sessions were no less focused on the problem at hand than the face-to-face encounters; in fact, they were actually characterized by less talking.
- On group choice: Participants were far more likely to hold divergent points of view, and to stick to those points of view, when they were using the computer. In other words, they were more resistant to social pressure.
- On interpersonal behavior: The computer-mediated discussions were much more uninhibited. People were far

more likely to curse their colleagues on the machine than in person.

Kiesler and her associates drew the following conclusion from the results: "Electronic communication involves a process of depersonalization or redirection of attention away from one's audience. Suppose computer-mediated communication prevented personal feedback and individuation of information and at the same time lacked a shared etiquette and, further, was influenced by norms from the computer subculture. This could have made group members more responsive to immediate textual cues, more impulsive and assertive, and less bound by precedents set by societal norms of how groups should come to consensus." In plain English: Communication by computer stimulates self-expression, which makes agreement by computer harder to achieve. Of course, whether that means that the resulting decisions are better is another matter altogether, and this study doesn't offer any conclusions here. Other studies indicate that computer-mediated decision making tends to be weak. But the jury is still out on this point.

A Computer Subculture

Let's take a closer look at the results and the conclusions. First, it is important to understand the significance of the social context for the impact of computer technology—the "norms from the computer subculture," as Kiesler et al. put it. The subjects in this study were all Carnegie-Mellon students, who spent many hours working with computers and who belonged to the school's vibrant computer subculture. In their world, it's all right to curse someone on the machines, because bringing out the truth is always more important than being polite. But suppose the researchers had used prim and proper students from Brigham Young University? The results undoubtedly would have been quite different; the Brigham Young conversations probably would have been a lot less salty. In fact, all the results, not just the nature of the subjects' interpersonal behavior, might have been attenuated. Nevertheless, I think that the Carnegie-Mellon study has touched the core of computer technol-

ogy, and its findings would apply to almost any situation.

We've Only Just Begun

How do computers change the way we think and behave? Obviously, that's an enormous question, and I won't even try to answer it in depth here. But the Carnegie-Mellon study has given us a good start. For it indicates that when you sit down at a computer terminal and try to forge an agreement with other people, who are also sitting at a terminal, your behavior changes. You pay less attention to the status of your colleagues. You de-

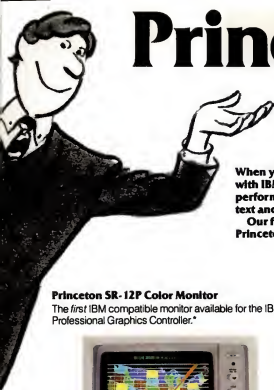
When you sit down at a computer terminal and try to forge an agreement with other people who are also at a terminal, your behavior changes.

mand more of a say in the discussion. You don't give up easily and try harder to convince others of the rightness of your point of view. You spend less time on chitchat and more on the issue at hand. And you take matters more to heart, unhesitatingly letting loose with a few choice epithets when you're feeling angry or frustrated.

Unfortunately, the Carnegie-Mellon study focused on only one of the computer's almost infinite number of applications. Is the use of personal computers by ever growing numbers of writers changing the way they write and what they write about? Is the proliferation of personal computers at all levels of business and governing chipping away at the authority of the higher ups? Alas, researchers have only begun to ask the questions, let alone conduct the studies, that might yield the answers. No one will probably really understand the way computers have affected us until they have been an integral part of our world for many, many years. But some day you might look back on this period, the halcyon days of computers, and see the beginnings of a sea change in your thoughts and behavior. ■

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lets you best
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graphics cards?**





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When you put Princeton Graphic Systems Monitors to work with IBM's new graphics cards, you step up to a new class of performance. Exciting RGB color, sharp, crisp graphics and text and Princeton's quality and reliability...all at a great price!

Our full line of monitors clearly demonstrates why Princeton is an industry leader in high-resolution technology.

Princeton SR-12P Color Monitor

The first IBM compatible monitor available for the IBM Professional Graphics Controller.*



COMPARE:	Princeton SR-12P	IBM 5175
Dot pitch (The lower, the better)	.26 mm	.31 mm
Sugg. Retail Price (The lower, the better too!)	\$999	\$1295
Warranty	1 Year	90 days

Designed for demanding professionals who won't settle for anything less than the finest color graphic capabilities. Displays more than 4,000 brilliant colors...features an anti-reflective coated black matrix tube for less fatigue and eye strain. You get the sharpest graphics and text...at a substantial savings!

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The superior choice for use with IBM's Enhanced Graphics Adapter.*



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Sugg. Retail Price	\$785	\$849
Tinted Black Matrix Tube	Yes	No
Warranty	1 Year	90 days

Ideal for most computing applications, the HX-12E offers 64 high-resolution colors and easy-to-read text. Compare Princeton's quality to IBM's...



Princeton HX-12E



IBM 5154

The HX-12E gives you sharper colors, crisper characters...for less eye strain and easier viewing, hour after hour. Built-in versatility also allows you to display 16 colors with the IBM Color Graphics Adapter* automatically.

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Princeton HX-12 Color Monitor—16 sharp, clear colors and superb character definition make the HX-12 the winning choice among monitor users...



Princeton HX-12



IBM 5153



See the clearly superior Princeton Monitors at your Authorized Princeton Graphic Systems Dealer. For the dealer nearest you, please call: **600-221-1490 (Extension 602)**, 609-683-1660 (NJ only), Telex: 821402 PGS PRIN.

Princeton Graphic Systems, 601 Ewing Street, Bldg. A, Princeton, NJ 08540.



1984 and 1985 winner of the PC World "World Class PC Competition"†

* Or equivalents

** When used with the Princeton Scan Doubler.

*** When used with IBM Color Graphics Adapter or equivalent.

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PRINCETON
GRAPHIC SYSTEMS
AN INTELLIGENT SYSTEMS COMPANY

CIRCLE 149 ON READER SERVICE CARD





Despite popular opinion to the contrary, low cost doesn't always mean less value, certainly not in the field of personal computing—some of the best new products on the market cost far less than you'd expect and offer many more features than the industry leaders do.



LOW-COST COMPUTING: WHERE THE SMART MONEY IS

Bitter price wars have turned the PC marketplace into a battleground during its few, furious years of existence. Well-established giants like IBM and Lotus are always under attack from bold competitors who claim to offer the customer more value for less money.

It is unlikely that a \$1,200 computer can outperform the IBM PC in all respects, or that a \$50 spreadsheet can be as versatile or powerful as Lotus's 1-2-3. Still, you don't always need to spend several thousand dollars for a PC or several hundred for software to make it work. By sacrificing some features and zeroing in on specific needs, you can save substantial amounts. And the savings can be truly significant for corporations that might need to purchase dozens of personal computers and an assortment of software for each user (see sidebar, "Site Licensing: An Option for Volume Buyers").

In the following articles, *PC Magazine* seeks out bargains that can keep your computing costs under control. Reviewers ex-

amine PC-compatible computers available for less than \$2,000 and software in four categories—word processing, accounting, spreadsheets, and database management—priced less than \$200 per package.

The list is by no means complete: In each category we sampled only a few of the best products available. Small companies nationwide are marketing low-budget programs of all stripes, and many of them haven't let us know they exist.

We will continue to cover significant new low-cost offerings, both in the news

Cover Story Photography: Dennis Kitchen

and feature pages of *PC Magazine*. The following articles, however, will give any budget-conscious buyer a head start. Whether you represent a large company that buys hundreds of software packages at a time or a small operation that can't afford extravagance, there is money to be saved.

DAC Attack

DAC Software of Dallas, which manufactures the accounting package *Dac-Easy*, is a low-budget success story. Before unveiling the package this April, the company determined that there was no market leader in the accounting software field. DAC also knew that it couldn't succeed unless its program would be among the top three best sellers, a feat that would require moving 3,000 packages in a month. DAC decided that if Borland International could succeed with a \$50 programming package, the time for a mass-market discount approach had arrived.

After pricing the package at \$49.95, DAC began an advertising blitz and marketed the program through the mail. During the first month, it sold 4,000 packages, and sales projections for July were more than twice that. DAC had hit the top of the accounting software charts, directing its appeal to some 18 million businesses that needed general ledger software.

Many people believe that they should expect less from low-cost software—after all, if it doesn't fit their needs, little has been lost. The \$50 cost is only what it takes to treat a client to lunch after all. If a package at that price successfully generates one report, it has paid for itself.

DAC president Kevin Howe, however, disagrees with this line of thought.

"All new software should be better than anything else on the market," he says. "Low-budget software with lots of flaws can be 'just okay' and still find a market niche." But "just okay" wasn't good enough as far as DAC was concerned. "You can't have a new program that does 60 or 70 percent of the things that the market leader does—it needs to be 110 percent. You have to offer the best."

Dac-Easy is only the first of the company's low-priced high-power programs; this fall it will unleash a word processor and a payroll program for \$49.95 each. *Dac-Easy* now costs \$69.95—the increase in

price was necessary for developing a retail channel and giving dealers a slice of the pie, Howe says. About 20 percent of sales are now coming from dealers, and he says that DAC made the move to give customers suspicious of mail orders the choice of buying retail.

Osborne to Run

Paperback Software, the Berkeley corporation headed by Adam Osborne, began selling low-priced word processing and spreadsheet programs earlier this year. Osborne says that the cost of packaging and support pushes software costs unnecessarily high and predicts that all applications software will drop to \$50 or \$100 in the next year.

"Everything is going according to our expectations," spokesman Mike Burdick says about the company's progress. "We did not anticipate a huge demand; low-priced software is something people have to get used to. We're fighting the prejudice that if something costs that little it won't be very good."

Burdick pooch-pooches the idea that software manufacturers need to keep prices high to recoup product development costs. "If someone has a totally new application, that's one thing," he says. "But how many times do you have to do that much development for a word processor? All these programs have been written a whole bunch of times before, and every new, expensive program is just another word processor, spreadsheet, or database."

Although Howe foresees a decline in software prices, he disagrees with Osborne's prediction that they will fall quite so low. Dave Winer, president of Living Videotext in Mountain View, California, also disagrees, saying, "If he were right, he'd be doing a lot better now."

Winer, whose company manufactures the \$199 *ThinkTank* and has just released a \$99 product, feels that \$99 is the optimum price for software. "You can't charge less than that and survive," he says. "It's the lowest credible price. People who charge less wish they could charge \$99. Sooner or later you have to start making money."

Howe disagrees with Winer's assessment of optimum price, and he has *Dac-Easy*'s success to back up his position. But Howe says that his program has done so

well because there was no market leader in the accounting software field.

"In any industry there is a bellwether, someone who sets the pace—Ashton-Tate for databases, for example, or Lotus for spreadsheets," he says. "It is the market leader that sets the price standard. Soon, though, you won't see word processing programs selling for more than \$150; word processing lost its market leader when MicroPro [manufacturer of *WordStar*] faltered."

Howe claims that *Dac-Easy* is as powerful as some \$600 programs, adding that he could have priced the DAC program in that range and generated respectable sales for several months. "Then, some upstart would come along and sell a good program for a little less," he says. "We prevented that with our pricing strategy, because \$50 is about the lowest you can go. We don't leave a lot of room for people to beat our price."

As all market observers know, hardware prices are accompanying software prices in their downward plunge. By creating a \$1,495 price niche for the model D—its new PC-compatible machine—Leading Edge of Canton, Massachusetts, hopes to strike a balance between IBM and Apple. The two giants have failed to penetrate each other's market niches, and Leading Edge chief operating officer Arnold Lasker feels that his company's personal computer is priced to be used both in business and at home. He points out that a computer at or below Leading Edge's price can be bought within the average Mastercard or Visa credit limit.

Some manufacturers have experimented a little before finding the right price. Consider the checkered history of *Desk Organizer*, manufactured by Conceptual Instruments in Philadelphia: Introduced at \$250 in February 1982, the program's price stayed at that level for just over 2 years, when Conceptual hiked its price to \$295. The price was cut to \$195 last January, and again to \$99 in June.

Collopy says that his company is flexible enough to respond to the market. A large corporation supporting an expensive program doesn't have that flexibility: Its expensive sales, distribution, and customer support systems are like a high-speed train that needs a continuous supply of

fuel—money—to stay on track.

High prices haven't yet gone the way of the stegosaurus, and it is the public that will help keep them at this level. Recently, *PC Magazine* received a visit from representatives of a top word processing company showing off a slick new product: a fold-out-bound package which includes an

eight-page manual and two diskettes.

It didn't look extravagant. The retail price, however, was \$595. And while our visitors wouldn't divulge the manufacturing cost, they admitted that it was priced high for the "benefit" of their customers, who wouldn't value the product if it didn't cost an arm and a leg.

High price/performance products will clearly be available for a while for those who either feel the need to spend a lot of money or don't trust something priced below a certain point. For the rest of you, the best way to outfit yourselves without breaking the bank is by simply paying only for what you need. ■

SITE LICENSING: AN OPTION FOR VOLUME BUYERS

Site licensing offers corporate software buyers an alternative to paying for hundreds of copies of the same program, while protecting vendors against theft.

Loosely defined, site licensing is the vendor-authorized duplication of a software program within a defined area of a company. Beyond this, there seem to be as many different approaches to site licensing as there are companies offering the arrangements. Furthermore, one company's well-thought-out plan may be sneered at by another as "just bulk sales."

Differences in site licensing agreements range from selling master disks that can be copied only a set number of times to giving a user blanket permission to make unlimited copies. A particular agreement can cover only one local area network or can extend to any current employee, even granting users permission to take the program home.

Economic Attractions

Robert Phillips, PC coordinator for Shell Oil in Martinez, California, site licenses *Freestyle*, a word processing program from Summa Technologies of Beaverton, Oregon. "It's a more efficient way to do business," he says. "I wish all software vendors would do this. It makes good business sense as an investment, and it decreases the company's liability when it comes to misuse of software."

Phillips says his company quickly broke even on its \$10,000 licensing agreement with Summa, which allows Shell to make unlimited copies of the program. He adds that most of the big vendors don't offer site licensing. "They're so large they can afford not to. Smaller companies are offering site li-

censing agreements because they want to get into the market."

Phillips also uses several programs that are not site licensed. "When you're locked into a company that you've been buying from for a while," he says, "any radical change in a program is going to have economic consequences. But in the early stages of evolution, if you know you'll end up with 1,000 copies, site licensing significantly minimizes the first stages of cost."

But Will the Big Vendors Buy It?

So far, most of the major players are watching and waiting. A spokesman for Lotus Development Corporation says, "It's obviously a big issue, but there's danger in responding to a situation like this too quickly. We are taking the time to develop a fair solution."

One large vendor that has made a commitment to site licensing is MicroPro, manufacturer of *WordStar*. According to Fritz Feiten, manager of corporate sales, MicroPro is investigating a lot of different concepts. One of the most promising ideas is an arrangement in which a customer purchases one master disk and one master manual, with permission to duplicate both an agreed-upon number of times.

"A site license unbundles support and documentation from cost of product," says Feiten. "Site licensing puts the responsibility for duplicating the material on the company, but it also gives that company the opportunity to buy the type of technical support that it needs."

Feiten says that such agreements will help the vendor control distribution while helping corporations stay on the right side of the legal issue. MicroPro does not have any copy protection on *WordStar* but could set up some auditing procedures under a site licensing agreement. Feiten won't divulge what the price structure might be but says the fee "will be less expensive than the lowest discount price"—meaning the price at which *WordStar* is available from discount mail order houses.

Dealer Involvement

Any consumer interested in a volume purchase of software—which can be as few as ten copies—should contact the vendor directly to find out if there is a specific policy. You may find, however, that your local software store will be the one to complete the deal.

Dealers have been a difficult variable in solving the site licensing equation. Dealers don't like site licensing because it can cut into their business. Some vendors are, in fact, circumventing dealers to negotiate site licensing agreements directly with customers.

A company like Summa Technologies never had a large dealer network, so it has little to lose. But vendors with high retail visibility aren't about to cut out the people who made them what they are. "We need the support of dealers to sell site licensing to the corporate community," says Feiten. "We will not sell site licenses without compensating dealers." —Charles Berman



With careful and astute shopping, you can pare hundreds or perhaps even thousands of dollars from the cost of your computer, retain IBM compatibility, and still gather more features and better performance than IBM offers with a standard PC.



COST-CONSCIOUS COMPUTING

These days, a list-price IBM PC with two floppy drives and 256K bytes of RAM costs \$2,820. But that number doesn't have to be what you pay for your personal computer. PC-compatible bargains can be found, and with relatively little effort.

Not every low price is a bargain, however. If you're tempted to choose a computer by price alone, you may find yourself stuck with a nonfunctioning hulk and no one to turn to for help—or an operating system incompatible with the programs you want to run.

In the reviews that follow, the basis for evaluation was compatibility with and performance equal to or better than that of the standard IBM PC. This minimum assures you access to one of the largest software bases in the world. Other considerations in bargain hunting are more subjective. You may be willing to accept some shortcomings to save money. For instance, if you think there will be no tomorrow, you need not consider the expandability of the com-

puter you buy. However, if you suspect that your computing needs may change or grow, take a close look at how easily new features can be added. Machines that do not offer IBM hardware compatibility can severely limit your ability to enhance a system.

For many executives, the IBM name is a guarantee that factory service will be available at least until the Apocalypse. Moreover, service for the products of most major manufacturers is available nationwide, either directly from the maker's ser-

Clockwise from the shopping cart: Leading Edge Model D, Morrow Pivot II, Tandy 1200 HD, Tandy 1000, PC Designs FD-1000, and the IBM Portable PC.

LOW-COST COMPUTERS

vice centers or through service networks. If neither you nor your company is willing to dig into the hardware, be sure you have adequate protection.

With those considerations in mind, here are some of the leading inexpensive contenders. Any one of them will give you an exemplary mix of low price and solid performance, each capping the deal with its own features to match your particular computing needs. And while you're looking around, don't forget the PCjr—no longer manufactured but not yet officially discontinued. Many dealers are selling the fully enhanced model for under \$400, making it the best bargain around. Although quite PC-compatible (except with the latest memory-hungry programs and some copy-protected software), the PCjr suffers design limitations that prevent it from even reaching the minimal performance standard set by the aging PC.

TANDY 1000

Suffering from a Split Personality

The Tandy 1000 combines good PC compatibility with a very alluring, under-\$1,000 (without the monitor) retail tag. At one time the 1000 was openly compared to the PCjr, but it outlived the baby IBM by offering a combination of features that made it a serious competitor for the PC when cost was all important.

In several ways, the comparison between the 1000 and PCjr was justified. Both computers have cases of molded plastic, built-in color/graphics display adapters and a built-in serial port; both also lack parity checking on their main memo-

ries. But the 1000 is built on a solid stamped-steel foundation and allows full memory expansion inside its cases. Also, Tandy's engineers were enlightened enough to include sufficient space for two half-height floppy disk drives.

Unlike the PCjr with its external expansion system, the Tandy 1000 has three PC-like slots for internal enhancement. Alas, the 1000's smaller size militates against complete PC compatibility and limits expansion board length to 10½ inches. As most of today's network adapters require a full-length expansion slot, this short-slot-ness essentially eliminates the 1000 from consideration as a low-cost network node. Those three slots may be sufficient for your needs, however, because most of the functions usually stuffed onto expansion cards are already included on the 1000's system board, including its floppy disk controller, game and light-pen controllers, communications port, and a display adapter.

The Tandy 1000 keyboard is more compact and much lighter than that of the IBM PC. It features the typical improvements most keyboard makers offer: function keys that run above the numbers, dedicated cursor keys, indicator LEDs on the NumLock and CapsLock keys, and a small extra Enter button in the lower right corner. For some reason, the Ins and Del keys also have new homes, fitted at the top of a key array that includes dedicated Print, Home, Alt, and Hold keys. The keyboard, which is not plug-compatible with the standard IBM product, plugs into the front of the computer so that you don't waste half the cord running it around the machine.



The Tandy 1000

Unfortunately, the overall fit and finish of the entire computer is not even close to the IBM standard, and the keyboard typifies the problems. While the keyboard angle can be adjusted with two rotary feet, the adjustment requires so much force you may feel like something will break before the feet move.

Like the ill-fated PCjr, the Tandy 1000 suffers from an identity crisis. Although it should be able to handle almost any PC business program thanks to its Phoenix

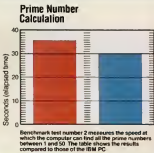
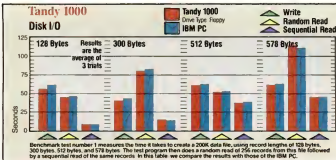
PC FACT FILE

Tandy 1000

Tandy Corporation
1800 One Tandy Center
Fort Worth, TX 76102
(817) 390-3011

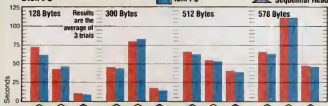
List Price: \$999 with 128K RAM, MS-DOS, and BASIC.

CIRCLE 679 ON READER SERVICE CARD



Leading Edge Model D

Disk I/O



Benchmark test number 1 measures the time it takes to create a 200K data file, using record lengths of 128 bytes, 300 bytes, 512 bytes, and 576 bytes. The test program then does a random read of 256 records from this file followed by a sequential read of the same records. In this table, we compare the results with those of the IBM PC.

Prime Number Calculation



Benchmark test number 2 measures the speed at which the computer can find all the prime numbers between 1 and 50. The table shows the results compared to those of the IBM PC.

Compatibility Systems ROM, the 1000 seems to be engineered more as a home computer. For instance, next to the keyboard jack are two joystick jacks on one side and a big red reset button on the other. Even if it is somewhat schizoid, however, the 1000 can be a hard worker when you need to make every dollar count.

LEADING EDGE MODEL D

Power Provided on the Board

The Leading Edge Model D is a new contender in the budget arena. Although its higher list price makes it look like more of a budget burden than lower cost machines such as the Tandy 1000 or PCjr, the Model D stands sufficiently ahead of the competition to justify its price. No bare-bones cheapie, it's a full-featured computer with standard no-extra-cost features that include nearly every option you might want: a parallel port, a serial port, two floppy disk drives, both RGB color and Hercules-compatible monochrome monitor adapters, and an amber display.

The Model D is a sturdy machine in a

tough metal cabinet that seems designed for business use. Very compact, its footprint is only about 14 inches square, and its 6-inch height allows just enough space for a pair of half-height Toshiba disk drives next to four full-length PC-compatible expansion slots.

All four slots are available for more-than-basic add-ons, because the necessary circuitry for the battery-backed-up time-of-day clock, all ports, monitor adapters, and floppy disk controllers are included on the large Daewoo Telecom system board that literally lines the bottom of the case.

A full 256K bytes of memory is standard. Two of the four banks of nine 64K-bit memory chips on the system board are socketed, and a jumper setting allows you to replace them with 256K-bit RAM chips to bring your total system memory up to 640K bytes without using any expansion boards at all.

The 130-watt power supply should be



The Leading Edge Model D

enough to handle any options you can fit inside the machine. The on/off switch is conveniently located on the front panel, accompanied by a red power-on indicator and a recessed reset pushbutton. The keyboard jack is there, too.

The Model D keyboard itself has a positive feel and keyclick similar to that of the IBM keyboard. Some of the key positions,



Among the bargain-priced PC-compatibles tested, **Leading Edge Model D** is the clear winner. That's not surprising—it's the newest machine tested and was designed around lessons that were learned from some of the others. It combines all the features that you could possibly want as standard equipment with a price that you'd expect to pay for a stripped IBM machine. Moreover, you don't sacrifice quality for the low price. The Model D is as sturdily built as any of the other computers we tested. If you demand quality but don't want to pay the premium price IBM demands for its name, the Leading Edge Model D is the machine for you.

however, have been rearranged to conform more closely to the Selectric typewriter layout (large Shift and Return keys, for instance) without totally abandoning the programmer-inspired placement of the auxiliary keys and combined numeric/cursor keypad.

The high-resolution monochrome monitor is somewhat unusually styled, though not unpleasantly so, and it looks completely different from the standard Leading



Leading Edge Model D

Leading Edge Hardware Products, Inc.
225 Turnpike St.
Canton, MA 02021
(800) 343-3436

List Price: \$1,495 with 256K, two disk drives, graphics/text monitor, MS-DOS, GW-BASIC, Leading Edge Word Processor.

CIRCLE 676 ON READER SERVICE CARD

Edge monitor. It's squarish, with an enlarged front to hold the 12-inch amber screen. Thumb-adjust knobs at the lower front edge control brightness and contrast. A more expensive version of the Model D includes a color monitor. You can hook both monochrome and color displays to a single computer and switch between them via software or a tiny toggle switch on the back of the system unit.

As you would expect from its 8088 microprocessor, the Model D performs exactly on par with the IBM PC. The Model D's Phoenix ROM BIOS pretty much guarantees complete software compatibility with PC programs.

Overall, the Korean-made Model D has the feel of a good stereo system translated into computer technology—and that's a plus. It may just represent the next generation of personal computing: about as compact as full IBM hardware compatibility allows, full featured, quite well made, and alluringly priced.

PC DESIGNS FD-1000

The Importance and Ease of Doing It Yourself

Another way to shave dollars from the price tag of a computer system calls for some intense shopping to search out the lowest price on each component making up the system—from monitors to disk drives to the main system board itself. With a little knowledge, some time, and a good measure of luck, you should be able to mix and match your way to a fairly re-



The PC Designs FD-1000

spectable computer system.

If that strategy takes more luck than you think you possess, just sidestep the issue and let someone else do the mixing and matching for you. PC Designs did exactly that in the FD-1000, its PC-compatible kit computer.

By spending from 15 minutes to 2 hours screwing a few components together, you can assemble a complete system, including high-resolution monitor and 256K bytes of memory, for less than IBM charges for a minimum-memory system unit alone (see accompanying sidebar "From Kit to Computer in 2 Hours or Less"). As a bonus, the FD-1000 also performs better than the IBM because its 8088 microprocessor can be switched to run at either a fast 8 MHz or the 4.77 MHz of a standard PC. Only the most persnickety programs should require the lower speed for complete compatibility.

The heart of the FD-1000 is a system

board made by ACS, Inc., that adds several useful functions to its two-speed processor: a controller for up to four floppy disk drives, two serial ports, a clock, and four banks of nine sockets each for parity-checked memory. The unit I tested had 256K-bit random access memory chips. DIP-switch settings allow you to fill the other three banks with 256K-bit and 64K-bit chips to bring total memory to the full 640K bytes. You can expand the system using its six full-length, PC-compatible expansion slots (one of which is taken by the display adapter).

In the \$1,600 kit, PC Designs supplies two Shugart half-height floppy disk drives, an STB Mono Plus display adapter, and a Princeton Graphic Systems MAX-12 amber monochrome monitor. With the \$400 remaining in the *PC Magazine* \$2,000 budget, I was able to obtain several options: a Prometheus ProModem 1200B internal modem, two communications programs (*PC-Talk III* and *Mite*), and DOS 3.1.

The FD-1000 keyboard, although not labeled with a manufacturer's name, strongly resembles the Key Tronic KB-5151. Its touch is very light and quiet. Bigger than the normal IBM issue, it features

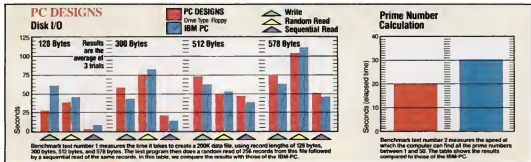


PC Designs FD-1000

PC Designs
105B E. 56th St.
Tulsa, OK 74146
(918) 252-5550

List Price: \$1,650 with 256K,
two disk drives, IBM
chassis, 150-watt power supply,
IBM-compatible keyboard.

CIRCLE 676 ON READER SERVICE CARD



both an independent cursor pad and a double-duty numeric and cursor keypad. Locking Shift keys all have LED indicators, as does a Power key that seems to do nothing but glow continually. Many keys are placed differently than they are on the

IBM PC keyboard, making the layout closer to that of a normal typewriter.

The high-speed setting of the microprocessor proved to be compatible with all the programs I tried, racing through them faster. Testing proved the point. Using Pe-

ter Norton's *Sysinfo* speed program, the machine achieved a rating 1.6 times faster than did an ordinary PC. If you're willing—and unafraid—to do a few minutes' worth of assembling, you should find the FD-1000 a top-performance bargain.

PC DESIGNS FD-1000: FROM KIT TO COMPUTER IN 2 HOURS OR LESS

You shouldn't be scared of a do-it-yourself computer kit. If you can turn a screwdriver, you can assemble this PC-compatible machine with no sweat.

If you've never dealt with the inner workings of something electronic, attempting to assemble a do-it-yourself computer kit may appear on a par with performing brain surgery guided only by a *True Adventures* comic book. Putting together the PC Designs FD-1000 kit, however, requires little more skill than knowing which end of a screwdriver to hold. Slide in eight connectors and about a dozen screws, and you're done. No soldering—or even technical knowledge—is required. In fact, you probably won't even need to look at the instructions, which are clear and complete—though not quite as exciting as *Spiderman*.

The Hardest Part

Your kit will probably arrive, as mine did, in several boxes. One will hold a metal case that would be an exact copy of a PC system unit were it only 2 inches shorter. Glue on an IBM logo swiped from a real PC, and few would suspect that your machine is counterfeit. Inside the case you'll find a fully assembled system board, already installed and completely set up.

Another box holds all the internal parts, actually subassemblies. The hard part of the job involves installing a power supply and disk drives in the case, plugging in the appropriate cables, and screwing everything together. A third box holds the monitor, and a fourth, the keyboard.

PC Designs estimates that the average

user should spend no more than 2 hours on the assembly process. If you decide to leaf through the manual, you might stretch out the chore to a whole evening. If your confidence or foolhardiness runs high and you ignore the instructions, you'll be done in a fraction of that time. Forty-five minutes after I opened the first box, I had the machine booting—and more than half that time was spent talking on the telephone when a call interrupted my progress.

Painless Procedures

The power supply—a shiny, chrome-plated box complete with an IBM-style giant red switch on its right side—arrives fully assembled and sealed so you don't get your fingers into anything that might be painful or dangerous. Four screws hold it in place at the rear of the computer.



A peek inside PC Designs' FD-1000, an easy-to-assemble computer kit.

er chassis. Once those are in, you plug two connectors into the system board and one into each disk drive.

Next, you mount the two half-height disk drives. They fit in the chassis either next to one another or both in one slot to leave room for adding a hard disk drive later. Black slot covers are supplied to dress up either arrangement.

You physically mount the drives using four screws—two for each drive. Unfortunately, I found that the holes were a fraction of an inch out of alignment, and I could use only a single screw per drive. Nevertheless, the drives were held firmly in place.

Connecting the disk drives to the system involves plugging a single cable into the system board, then into the back of each drive. The only other step is to slide the monitor adapter into its slot and screw it securely in.

By the time I had finished, my confidence was so high that I didn't even bother trying the system out before screwing the case together. I plugged everything in and turned it on; the system immediately came to life and has been working flawlessly since.

In all, the process involves little more work than installing a couple of expansion cards in a factory-built computer; it's probably as easy as buying a stripped-down PC and enhancing it yourself. —Winn L. Rosch

IBM PORTABLE PC

All-in-One Luggability from the Leader of the Pack

Portability helps you get the most from a single computing investment: One machine not only handles multiple jobs but also works at different locations, doing double or triple duty. Moreover, because one price buys a system complete with a monitor, the sometimes higher price of a portable can still be a good deal.

The basic IBM Portable PC gives you all the necessities for getting started in computing with genuine full PC compatibility and arm-stretching portability. Essentially, the Portable is a complete PC (actually an XT) system piled into a hefty case with a handle attached to reassure you that it can be hauled—or dragged—about.

Only the monitor has been shrunk to fit, down to the 9 inches that has become the norm for transportable computers. While its amber screen makes it easy on the eyes, the medium resolution that the Portable gets from the computer's internal color/graphics adapter hardly lends itself to readability, at least for single-spaced text.

The detachable keyboard is true-blue IBM with the same great feel and clatter that you'll find tethered to all official IBM



The IBM Portable PC

personal computers. The only addition is a trough that swallows up the cord when you pack the machine up.

With the standard-equipment floppy disk controller and monitor adapters in place, only a single full-length expansion slot remains inside the Portable. Fortunately, short expansion cards are available for most add-on functions—memory enhancement, communications, internal modem—so that you can save the one big slot to plug into a network.

Compared with other transportables, the Portable PC rates as a clunky eyestrainer, but it can earn its keep with its lower price, luggability, complete PC compatibility, and official IBM support.

MORROW PIVOT II

A Lot of Function in a Little, Laptop Package

If you prefer pumping iron in a gym to struggling through an airport with a computer, a low-cost alternative to the IBM Portable PC is the similarly priced Morrow Pivot II, a cross between a transportable

computer and a laptop. It's too big to actually hold on your knees, but it's light and convenient enough to tote comfortably. Although the Pivot will run on battery power, its design—with a nonremovable, fold-down keyboard—makes desktop use most convenient.

The Pivot is remarkable even among laptop computers for its clever combination electroluminescent/liquid crystal display. The whitish luminescent glow shines from behind the graphics-capable, 80-row



The Morrow Pivot II

by 25-column LCD screen, increasing contrast and making the screen readable even when light levels tumble. Like all LCDs, it is sensitive to viewing angle and requires you to adjust a thumbwheel knob for the best tilt. Alas, this control is flimsy and noisy, creating horrible on-screen flickers when you are adjusting it.

Contrary to the warnings in the instruction manual, I discovered that when the Pivot's batteries were charged, I could unplug it and it would continue functioning smoothly on its internal power without los-

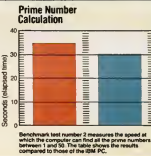
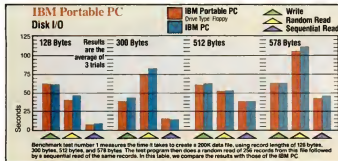
PC FIRST PRICE

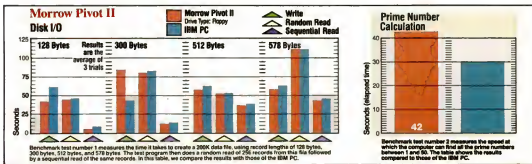
IBM Portable PC

IBM Corporation
1000 N.W. 51st St.
Boca Raton, FL 33432
(800) 447-4700

1st Price: \$2,895; price includes 256K RAM, two 360K disk drives.

CIRCLE 665 ON READER SERVICE CARD





ing a byte. In fact, the screen brightened when I switched to batteries. Memory remained intact when returning to AC power. Essentially, then, the Pivot has its own built-in uninterruptible power supply.

The Pivot keyboard is quiet, and its keys have a light touch. Beneath the keys, the keyboard's circuit board is plainly visible, just waiting for coffee or paper clips to burrow into it.

Behind the screen on the right side of the Pivot chassis lurks a pair of the tiniest 5¼-inch double-sided double-density floppy disks drives you're ever likely to see, roughly one-quarter the height of those in the PC. (One drive is standard on the least expensive model.) Nearly the whole front of each drive is taken up by a door that uses a press switch to snap open. Slide in a disk, gently close the door, and you're ready to go. The little drives were extremely quiet, but the system didn't handle disk errors well. Rather than issuing the standard disk error message when no disk or a bad disk was in its drive, our test system would just try and then wait, without putting an error message on the screen.

Turning the Pivot on does not cause it to boot automatically. Rather, you get to see a combined clock and world map that allows you to explore the local time in various cities. Push a membrane switch displaying a diskette icon, and the Pivot boots

the diskette in drive A:. Other icons invoke various internal functions, such as built-in communications software for its optional 1,200-bit-per-second internal modem.

Unfortunately, the demo unit refused to recognize the MS-DOS that accompanied it; therefore, I made my tests with a generic

The Morrow Pivot II's performance matched a plain IBM PC's almost exactly. At just under \$2,000, the tiny Morrow is a good buy for the executive on the move.

MS-DOS disk that might not have been optimized for the Pivot. Its performance, however, matched a plain IBM PC's performance almost exactly.

The Pivot sacrifices expandability for easy portability. For the obvious reason of lack of space, the Pivot is not compatible with PC-style expansion cards, or internal accessories. They just won't fit. Hence, you cannot connect a Pivot into your own network—yet. However, Morrow promises a plug-in, PC-compatible expansion unit.

At just under \$2,000 for the minimum-memory machine with two disk drives, a parallel and a serial port, and bundled software that includes *NewWord* and MS-DOS, the tiny Morrow is a good buy for the executive on the move.

TANDY 1200 HD

A Hard Disk That's Hard to Beat

In the many applications like database management that involve mostly storing and retrieving information from files, disk access speed is more important than the intrinsic power of the machine's microprocessor. In such cases, since performance can be boosted nearly tenfold by keeping files on a hard disk, an extra few hundred dollars for a system with such a high-speed disk gives you more of what you need—and makes it a real bargain.

When its roller-coaster price dips from \$2,999 to \$1,999—as it seems to every few months—the Tandy 1200 HD earns high marks as possibly the lowest priced factory-equipped hard disk system available. That price belies the fact that the Tandy is sturdy, well made, and probably as close to the IBM standard as any non-IBM computer can get.

Inside the steel shell of the 1200 HD, you'll find a compact, 12-by 8-inch system board that's electronically equivalent to that of a PC-XT, complete with an 8088 microprocessor operating at 4.77 MHz. Standard on-board memory consists of 256K bytes of RAM in the form of 36 64K-bit chips. As per IBM practice, the

PC
Morrow Pivot II
 Morrow Inc.
 600 McCormick St.
 San Leandro, CA 94577
 (415) 430-1970
 List Price: \$1,995 with one disk drive, 256K RAM.
 CIRCLE 677 ON READER SERVICE CARD

PC
Tandy 1200 HD
 Tandy Corporation
 1800 One Tandy Center
 Fort Worth, TX 76102
 (817) 390-3011
 List Price: \$1,999 with 256K RAM, parallel port.
 CIRCLE 663 ON READER SERVICE CARD



The Tandy 1200 HD

1200 HD's RAM is parity checked.

Compared with the XT, however, the 1200 HD is three expansion slots short: It has but five full-length slots, three of which are factory-filled with a monitor adapter, a floppy disk controller, and a hard disk controller. Even though a printer port is standard on the floppy disk controller, you may find only two available slots limiting.

The keyboard of the 1200 HD is closer to the IBM standard than other Tandys. Like most compatible manufacturers, Tandy reversed the left-hand Shift and backslash keys from the IBM standard and added an Enter key on the far right of the keyboard and LED indicators to the Caps-Lock and NumLock keys. The keyboard uses hard-contact technology, operates almost silently, and has a linear feel that gives you no tactile indication when contact has been made.

FINDING A USED COMPUTER

The classic way to save money when buying anything from a car to a camera is to buy it used. Alas, computer shoppers searching for used IBM PCs or PC-compatibles face two large obstacles—a short supply of used gear and IBM's pricing policy. Once a PC finds a happy home, its owner is unlikely to part with it. Moreover, Big Blue seems to stay one price slice ahead of depreciation. Either the original owner must take a big loss, or his sale price will be within a hairsbreadth of the more aggressive dealers' price tags on new computers.

The only thing the used-computer shopper has going for him is obsolescence. There will always be newer, better, and faster computers—and as long as there are new computers, users will want to trade up. As PC users move up the performance ladder, they're likely to trade in or sell their old clunkers. (Of course, they're even more likely to turn the old machines into hand-me-downs for junior officers.) All you can do as a used-computer shopper is to pose, vulturelike, and wait for the sell-off.

Finding a used-computer bargain is a challenge in itself. If the want ads in your

local newspaper prove barren (as they probably will), try broadening your search. One place to look is *Computer Shopper*, published by Patch Publishing Company (407 S. Washington Ave., Titusville, FL 32781), which calls itself the "National publication for buying-using-selling computer hardware and software." Indeed, you'll find its 200 or more newsprint pages crammed with ads offering just about anything that has to do with small computers.

Unfortunately, if you search *Computer Shopper's* classified section for the bargain of the century, you're likely to find no more than a single column devoted to MS-DOS machines. For example, the classified ads in the August 1985 issue offered only four IBM computers—two PCs, one AT, and a 9000.

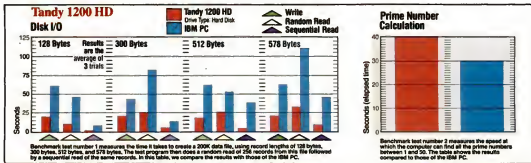
A better bet may be checking in with local dealers for trade-ins. Check with the local users groups for members moving up to higher-performance computing. Post a notice on your favorite bulletin board. The more places you look, the more likely you are to find the machine you want at the price you want to pay.

Winn L. Rosch

The 1200 HD's ROM BIOS, written by Tandon Corporation, does an excellent job of achieving true PC compatibility. Compared to that of a PC-XT, the hard disk of the 1200 HD reads faster and writes slightly more slowly, but it is still an order of magnitude faster than a floppy.

The 1200 HD is a good alternative for people who want an inexpensive hard-disk-based system but are afraid to put in an inexpensive mail-order disk drive. ■

Winn L. Rosch is a contributing editor of PC Magazine.



Compare the Hercules Color Card to IBM's.

Five reasons why the Hercules Color Card is better.



IBM Color Adapter \$244



Hercules Color Card \$245

- | | | |
|------------------|--|--|
| 1. Compatibility | Runs hundreds of graphics programs. | Runs the same hundreds of graphics programs. "The Hercules Color Card is so nearly identical to the IBM Color/Graphics Card that it's almost uncanny." PC Mag. |
| 2. Printer port. | None. | Standard. Our parallel port allows you to hook up to any IBM compatible printer. |
| 3. Size. | 13.25 inches. Limited to long slots. | 5.25 inches. Fits in a long or short slot in a PC, XT, AT or <i>Portable</i> . |
| 4. Flexibility. | Can't always work with a Hercules Graphics Card. | Always works with a Hercules Graphics Card by means of a software switch. |
| 5. Warranty. | 90 days. | Two years. |

Any one of these five features is enough reason to buy a Hercules Color Card. But perhaps the most convincing reason of all is just how easy the Hercules Color Card is to use: "Right out of the box, the Hercules Color Card goes into an empty expansion slot, ready for you to plug in . . . and go to work—no jumpers, no software. For most applications, it's just that easy." PC Magazine.

Call 1-800-532-0600 Ext. 420 for the name of the Hercules dealer nearest you and we'll rush you our free info kit.

Hercules.
We're strong on graphics.

For seekers of low-priced software, the word processing marketplace is heaven, with an abundance of high-quality programs available at prices that range from merely attractive to downright irresistible. Here are six tempting examples.



WORD PROCESSING FOR THE DOLLAR-WISE

The road to fast, powerful, feature-laden word processing software on the PC can be a costly one, especially if you need to order multiple copies. But what if you don't need all the speed of *Xy-Write* or the power of *Microsoft Word*? What if you could do without some of the extra-special features in *WordStar*? Then you could save as much as \$500 on your next word processor, that's what.

The six word processors reviewed here range from \$200 to the can't-afford-to-pass-it-up price of \$9.95. Can you run an office with any of these programs? You bet. It all depends on what you're willing to sacrifice.

In lower-priced word processors you won't find such goodies as library functions, spelling checkers, style sheets, print spooling or queuing, automatic hyphenation, on-screen tutorials, or multiple-column printing. They don't have the full range of cursor movement keys, editing control, or print enhancement support of the expensive programs either.

What you don't have to sacrifice are features that are probably indispensable to your business: boldface, underline, line centering, full margin control, footnotes, headers and footers, global search and replace, block functions, file merging, printing to disk, indexing, undelete, and on-line help. It's important to note that higher price, even in the low-budget lineup, does not always reflect a more impressive performance: In our tests, *Textra* (\$9.95), *DisplayWrite 1* (\$95), and *Executive Writer* (\$69.95) took most of the honors.



IBM PC
and
XT
are
registered
trademarks
of
International
Business
Machines
Corporation.

DISPLAYWRITE 1

Low-Cost Power with Few Major Sacrifices

DisplayWrite 1 is a fast and surprisingly good office word processor. It's packed with useful features, so it is particularly distressing that the program's documentation is not up to par.

So many sections of the manual are dedicated to getting started that it's difficult to begin without some confusion. You can find a separate index for the program behind sections on single-drive systems, double-drive systems, and using the program on an AT. All the information you'd want about the program does actually appear somewhere in this manual, but sometimes it's hard to put your finger on it in a hurry.

The program boots to a seven-choice menu; mostly simple document-handling functions. If you select the first option, Create Document, the writing/editing screen appears. This screen is blank except for the top three lines: The first line tells you whether you are editing or creating a document, the second contains the page and line number, and the third is the ruler line, containing margin settings and tab stops.

DisplayWrite 1 dedicates the PC's function keys to major commands, such as getting help, bringing up a directory, and adjusting lines and pages after editing. A keyboard template that sits across the top of the keyboard is provided for the PC, PCjr, and AT.

On-line help is not context sensitive; it appears in a text file through which you simply page up and down until you find the information you want. This adequate help file simply lists the keys and the commands they implement, followed by brief descriptions of each command.

PC FORTUNE



DisplayWrite 1
IBM Corp.
P.O. Box 1328-S
Boca Raton, FL 33432
(800) 447-4700
List Price: \$95
Requires: 128K RAM,
one disk drive, DOS 2.1.

CIRCLE 697 ON READER SERVICE CARD



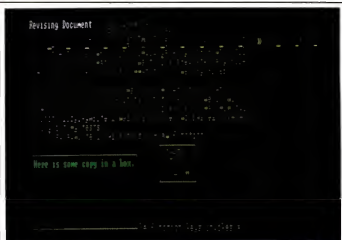
DisplayWrite 1 is the obvious choice for a large office staff that will use a word processor to perform many tasks. It offers the most features, particularly in formatting and printing. *DisplayWrite 1* also boasts some very esoteric features, such as a cursor draw feature for drawing boxes or such geometric shapes as rough bar or organizational charts.

If ease of use is your first priority, you should choose **PFS:WRITE**, a program every user will quickly be able to learn. It's completely menu driven and lets you see what all your printouts will look like in every case. One of the reasons it's so easy to learn is that it sticks to the ten function keys for special tasks, ignoring the Ctrl and Alt keys. Its tradeoff for this ease of use is that the program offers only plain-vanilla formatting—nothing fancier than bold, underlining, flush left, and flush right. **PFS:WRITE** does have some fancier features, such as the ability to do envelopes and to include a list of names from **PFS:FILE** for a mailing.

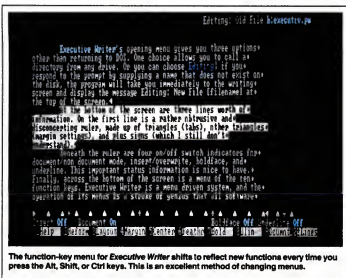
DisplayWrite 1 performs block moves, search and replace, and all other editing functions very well. Prompts help you maneuver through each procedure quickly. As a matter of fact, *DisplayWrite 1* emerged as one of the two fastest programs overall throughout *PC Magazine's* benchmark tests.

Pressing almost any of the function keys invokes a small menu at the bottom of the screen with further choices. For example, if you select a block function by pressing F4, the line "Move Copy Delete Recall Save" appears. You can select one of those tasks by moving the cursor and pressing the Return key or by typing its initial letter. This submenu system helps tremendously.

DisplayWrite 1 has some exotic features not found on other programs in this category, such as a cursor-draw capability: You can draw lines, boxes, and other geometric figures that will print out in your text. While this program may be a weakling when compared with its siblings *DisplayWrite 2* and *DisplayWrite 3*, it gets a very high rating on price versus performance. It is a good example of a low-budget office word processor that gets the job done without sacrificing speed or important features.



DisplayWrite 1 has a nifty cursor-draw feature that lets you dress up your document by adding simple lines, boxes, and other geometric shapes.



The function-key menu for Executive Writer shifts to reflect new functions every time you press the Alt, Shift, or Ctrl keys. This is an excellent method of changing menus.

EXECUTIVE WRITER

Helping Out Around the Office

Executive Writer's opening menu gives you three options other than returning to DOS. One choice allows you to call a directory from any drive. Or you can choose **Editorial** if you respond to the prompt by supplying a name that does not exist on the disk, the program will take you immediately to the writing screen and display the message "Editing: New File (filename)" at the top of the screen.

At the bottom of the screen, three lines display document information. The first line is a rather obtrusive and disconcerting ruler, made up of triangles (tabs), other triangles (margin settings), and plus signs (which I still don't understand).

Beneath the ruler line are four on/off switch indicators for document/non-document, insert/overwrite, boldface, and underline modes. This important status information is nice to have. Finally, across the bottom of the screen is a menu of the ten function keys. Executive Writer is a menu-driven system, and the operation of its menus is a stroke of genius that all soft-

ware manufacturers should adopt.

The program, like SSI's *Word Perfect*, was designed to use the function keys alone and in conjunction with the Alt, Shift, and Ctrl keys to yield a total of 40 dedicated function commands. Of course, this is far too many to remember, and it's difficult to fit that many commands on a keyboard template without confusion. Executive Writer lets you keep track of the key assignments without ever looking away from the screen: When you press the Alt key, for instance, the menu at the bottom of the screen shifts to reflect the functions of the ten Alt-function key combinations. The menu changes again when you press Ctrl or Shift; the latter is a bit distracting—the menu flashes a little every time you capitalize a letter—but the extra convenience makes it worthwhile.



Executive Writer
 Paperback Software Int'l
 2612 Eighth St.
 Berkeley, CA 94710
 (415) 644-2116
 List Price: \$69.95
 Requires: 128K RAM, DOS 2.0
 or later, one disk drive.

CIRCLE 696 ON READER SERVICE CARD

Executive Writer gives you all the common editing, formatting, and printing functions in an easy-to-use package that is made even easier by an excellent, though not context-sensitive, on-line help screen. The F1 help key will bring up a screen prompting you to hit the command key you need help with or another F1 if you're not sure. When you find the key or command you want, you press or highlight it to learn more. This way you can feel your way through much of the program.

Executive Writer performed block moves and file merges faster than any other program, though the rest of its scores were average. Reformatting the file with new margin settings and indented paragraphs is a nightmare, however. Margins are not the problem; in fact, they are easily changed. But paragraph indents must be entered manually with the space bar, which misaligns the text and forces reformatting of every paragraph.

The program offers a good range of features—certainly all the indispensable ones and then some—and its menu system makes Executive Writer an easy program to learn and to remember. It is well suited for memos, correspondence, and short manuscripts and reports.

PC-WRITE

Power for the Price of a Download

PC-Write is a shareware program: You can find it on many bulletin boards and download it for a small fee, or you can order it from Quicksort for \$10 and print out the manual yourself. It would be worth it if *Textra* wasn't so much better for the same price. PC-Write offers some advanced features not found in *Textra*, such as dot commands for inserting special codes, but learning to use them is very difficult. In fact, PC-Write is a fairly powerful program, but the others reviewed here are much easier to learn and use.

The function keys are used alone and with the Ctrl key for 20 dedicated commands, such as marking text, search and replace, and centering lines. These major editing commands are straightforward. Block moves, for example, are extremely easy. You begin marking by pressing F6, then highlight the block with the cursor

PFS:WRITE

Coming from a Good Family

PFS:WRITE is one of the easiest word processors on the market, and also one of the best in this low-cost roundup. All its major functions are selected through a main menu and series of submenus, and all editing commands are assigned to the ten function keys, alone and in conjunction with the Shift key.

The main strengths of *PFS:WRITE* lie in the simplicity of its menu and submenu operation and in its use of nothing but the function keys for commands.

The main menu of **PFS:WRITE** offers six functions, the first of which takes you to the writing/editing screen and the last of which takes you back to DOS (but not without a "save your file" warning). The second option on the menu, Define Page, allows you to select all four margins and lines per page and type your headers and footers. It comprises a very convenient menu in itself. The third option is for the print menu, which lets you select a disk file or the printer, print a range of pages, and set line spacing, justification, and type of paper. The fourth option lets you retrieve, store, or delete a file and takes you to a submenu as well. The fifth option simply clears the workspace of the current document.

Text is typed in a bordered area, and what you see is what you get. The bordered area is actually a rectangle several screens tall that physically marks not only the left and right edges of the screen but also the top and bottom of each printed page in your text.

Text automatically adjusts to any editing or formatting commands, so you don't have to reformat paragraphs or repaginate. The ruler line runs along the bottom of the screen, marking the position of the cursor, margin settings, and tab stops. Beneath the ruler line, on which tabs are set, is a percent-full indicator for your document and a line and page number. *PFS:WRITE* really makes it difficult for you to get lost or forget what you're doing. The single help screen, which duplicates the function key template and lists the cursor movement keys, is generally adequate, but in some cases more on-line help would be useful.



What PC-Write needs is a better status line. On-line help consists of fairly complete information on the program's many commands, but the help screens are too crowded.

movement keys in Wang style. *PC-Write* also gives you the ability to record macros, a big point in its favor.

The problem with *PC-Write* is that while simple functions are equally simple to perform, complex functions are equally complicated. The manual doesn't help matters much as it is inexpensively produced and poorly organized with an index that will drive you crazy.

PC-Write wins no speed medals except for saving files and returning to DOS, which it does at lightning speed—just 2 or 3 seconds for average-size files.

The program is written in modules. To edit or write, you load the editor; to print, you return to DOS and load the printer program. This partitioning allows *PC-Write* to run under 64K bytes of RAM but offers

no other advantage, and it seems an antiquated design in comparison with other programs. As for print options, there is no print menu, and you have to set up the printer driver yourself. If you want your printer to do something special, you'll have to learn various dot commands and then experiment until you get it right. Personally, I'd rather give up than attempt to learn all these commands.

The writing screen itself is nearly blank, with just one line of information at the top. This would be fine if that line were helpful. As I typed this review, the line read "F1 Help. Push:JustOff. 97% Free. 99% Thru. Edit [filename]." Needless to say, I've seen better status lines. You can call up a ruler line if you need it.

The on-line help is complete, though not context-sensitive, and the help screen is cluttered with information, making it a bit difficult to find what you want at a quick glance. Still, the help was enough to get me through most of the program without referring to the manual too often, and a keyboard template holds every command of the program.

At \$10, you can get your money's worth from this program, but if you're willing to move to a higher price range, you can do a lot better.

PC



PC-Write
Quicksoft
219 First Ave. N #224
Seattle, WA 98109
(206) 282-0452
List Price: \$10 for disk; \$75
registration (includes bound
manual and customer support).
Requires: 128K RAM,
one disk drive.

CIRCLE 805 ON READER SERVICE CARD



With PFS: WRITE, what you see on-screen is what you'll get from the printer. Blocks of text are highlighted in the style of a dedicated Wang, then moved or copied.

You implement block functions with the F5 key. Blocks are highlighted with any cursor movement keys, then deleted, moved, or copied with other function keys. A buffer holds deleted blocks of no more than 100 lines, a serious drawback for many office applications.

The manual is fairly slim, but it is well written. Everything is presented in a very straightforward manner, and the program is simple to install and learn. This simplicity is the program's forte: You can learn most of its features in an afternoon.

You add boldface and underlining once you've written the text by holding the Shift key down and typing F8 or F7, respectively. By keeping those keys held down you can boldface continuously. While it isn't a very flexible or fast way of entering the enhancements, it is simple. Line centering is even simpler: Just press the F8 key and a

prompt asks you whether you want the line flush left, centered, or flush right. Unfortunately, there is no way to center or flush right text except line by line.

Other function keys trigger search and replace, file merging, block functions, and

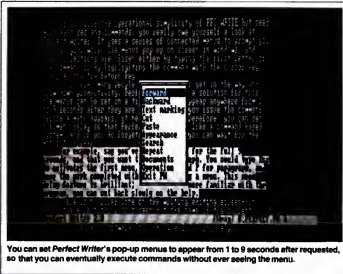
cursor movement commands. The F1 function key is the help key, with an always-visible prompt at the bottom of the screen so you can't forget how to look up the program's major functions while you're in the middle of your work.

PFS:WRITE gives you most of what you need for correspondence, documents up to about 16 pages, and simple reports. It integrates very well with companion programs PFS:GRAPH to produce graphs within text and with PFS:FILE for mail merging. For most word processing work, PFS:WRITE will suffice, and it will please you with its simplicity of operation. But if you have lengthy reports or manuscripts to prepare or you need complicated formatting, this program just doesn't have enough features.

PERFECT WRITER

Learn as You Write with a Powerhouse

If the operational simplicity of PFS:WRITE sounds good to you but you need more features and commands, you really owe yourself a look at *Perfect Writer*. This program uses a series of connected menus to prompt you through your work.



You can set *Perfect Writer's* pop-up menus to appear from 1 to 9 seconds after requested, so that you can eventually execute commands without ever seeing the menu.

PC

PFS: write
Software Publishing Corp.
1901 Landings Dr.
Mountain View, CA 94043
(415) 962-8910
List Price: \$140
Requires: 128K RAM,
one disk drive

PC

PFS: write
Software Publishing Corp.
1901 Landings Dr.
Mountain View, CA 94043
(415) 962-8910
List Price: \$140
Requires: 128K RAM,
one disk drive

CIRCLE 694 ON READER SERVICE CARD

The menus pop up on screen in windows, and you choose their options either by typing the first letter of the command or by highlighting the command with the cursor key and pressing Return.

Of course, many people feel that menus get in the way and slow down productivity. *Perfect Writer* has a solution for this: The menus can be set on a timed delay to appear anywhere from 1 to 9 seconds after they are requested. If you issue the command before a menu appears, it never appears. Therefore, you can set the menu delay so that *Perfect Writer* acts like a command-based system; and if you do forget the commands, you can wait for the menus to appear.

For example, say you've set the delay for the full 9 seconds and you want to cut a paragraph. You could type Esc to activate the first menu, C for Cut, and P for Paragraph and have the work completed without ever seeing a menu. This menu delay feature is brilliant; as you become more familiar with the program, you can cut back on the help.

Perfect Writer uses no ruler line on the writing/editing screen—in fact, there is nothing on screen but the name of the current document plus a reminder to type a question mark to invoke the help menu. This design yields the maximum display space, but you will probably long for a ruler line. The only way to get one is by dividing the screen into a pair of horizontal windows, which are separated by a ruler. I don't know why this can't be called up for a document in a single window.

Speaking of windows, *Perfect Writer* can keep up to seven active documents open at once, and you can cut and paste from one to another by splitting the screen into two windows. *PC-Write* is the only other budget program that offers even a single window, and none of the others of-



Perfect Writer
Thorn/EMI Computer
Software, Inc.
1881 Langley
Irvine, CA 92714
(714) 261-6600
List Price: \$199.95
Requires: 128K RAM,
two disk drives.



CIRCLE 693 ON READER SERVICE CARD

ACCESSORIES FOR THE WELL TAILORED OFFICE

Finding a deal on your computer system doesn't mean much if you pay through the nose for your peripherals.

Shopping for your computer system is like shopping for your new fall wardrobe: Pick the wrong accessories and you can ruin the effect. With this in mind, here's a look at some low-budget printers, modems, communications programs, business graphics programs, and desktop managers that can enhance your system (or systems) affordably.

There are at least three low-cost choices in dot matrix printers. Each offers such standard print enhancements as underlining, boldfacing, and condensed and enlarged print, and each offers features like PC-compatible graphics.

The **Centronics GLP** is a \$299 wonder. GLP stands for *Great Little Printer*, an accurate description of this product. The GLP's single best feature is a near-letter-quality mode that's amazing for the price. Measured speed on our standard tests is 30 characters per second in draft mode and 12 cps in enhanced mode. (Centronics Data Computer Corp., 1 Wall St., Box CS095, Hudson, NH 03051; 603-883-0111)

At \$399, **Panasonic's KX-P1091** offers a standard, 58-cps draft quality mode, but its dynamite near-letter-quality mode, at 19 cps, is impressively difficult to distinguish from a typewritten copy. The P1091's graphics are equally impressive—as is the printer overall. (Panasonic Industrial Company, One Panasonic Way, Secaucus, NJ 07094; 201-392-4644)

The \$499 **FX-85** is Epson's response to the IBM Proprinter. The FX-85 has both the IBM high-order character set and Epson's own italics, with either font set selectable at the flick of a DIP switch. Draft quality mode scores a measured 80 cps, while near-letter-quality mode, at 21 cps, is among the best available. (Epson America, Inc., 2780 Lomita Blvd., Torrance, CA 90505; 213-449-1276)

If nothing less than true letter-quality output will do, the \$659 **Panasonic KX-P3151** is the printer to get. The P3151 uses Diablo control codes, a widely used standard, and prints at a measured 22 cps, giving true, Selectric-quality output at a respectable speed and an affordable price. (Panasonic Industrial Company, One Panasonic Way, Secaucus, NJ 07094; 201-392-4644)

Modems Operandi

It's no trick to find a 300-bit-per-second modem for under \$100, but modem prices are dropping so rapidly that 300-bps units may soon go the way of the dinosaur. If you spend extra money on a faster modem now, it will turn out to be less expensive for you in the long run.

Cermetek's recently announced **Info-Mate 1200-TPC** is a good offer. This \$198 modem comes with its own communications program. **BCN's Smartlink II**, even less expensive at \$179, comes without software. Both the Info-Mate and the Smartlink II modems are autodial, autoanswer, Hayes-compatible modems. (Cermetek Microelectronics, Inc., 1308 Borregas Ave., Sunnyvale, CA 94089; 408-752-5000. Business Communications Network, 2533 S. Highway 101, #210, Cardiff-by-the-Sea, CA 92007; 619-436-2619)

If you're eager to jump on the 2,400-bps bandwagon, the obvious choice is the \$450 **CDS 224** modem (or the \$495 CDS 224 autodial modem). Be aware, however, that the autodial version is not Hayes-compatible, which means you may have trouble getting it to work with your favorite communications software. (Concord Data Systems, 303 Bear Hill Rd., Waltham, MA 02145; 617-890-1394)

If you want 2,400-bps speed and Hayes compatibility, your budget will

have to stretch a bit. The U.S. Robotics **Courier 2400** external and the **Micro-link 2400** internal modems are the best buys in this category at \$699 each. Both modems are Hayes compatible and will work with most software designed for the Hayes. (U.S. Robotics, 1123 West Washington Blvd., Chicago, IL 60607; 312-733-0497)

PC-Talk Is Cheap

Modems need communications software. **PC-Talk III** is the obvious choice—only partly because you can get it for free. More importantly, the program does most things that you are likely to need. If you can't find **PC-Talk III** on a bulletin board, you can send \$35 to Headlands Press. (Headlands Press, Inc., P.O. Box 862, Tiburon, CA 94920; 415-435-0770)

Another good choice for communications software is **D-Cube**, which should be available by the time you read this. **D-Cube** was designed to look and act very much like **PC-Talk III**, except that it is written in Turbo Pascal and adds a few embellishments, such as an optional phone log for tracking your calls. You should be able to find **D-Cube** on bulletin boards, or you can get send \$35 to the program's developers. (Dorn Stickle, 909 Cactus Dr., Round Rock, TX 78681; 512-255-9126)

Budget Graphics

In the graphics arena, at least four programs stand out for price and performance. **PC-KEY-DRAW** is a MacPaint-like tool for drafting and freehand drawing. You can get a full working copy without support for \$15, or you can pay \$70 and get phone support and updates. (OEDWARE, P.O. Box 595, Columbia, MD 21045-0595)

Giraph Business Graphics, at \$95,

offers automatic generation of several kinds of graphs, including line, bar, scatter, and three-dimensional pie charts. **Zebra Business Graphics** is a somewhat limited version of the same program that costs \$45 but lacks plotter support. (CompuVision, 70 Greenwich Ave., #169, New York, NY 10011; 212-620-8134)

PC Illustrator, at \$95, offers both freehand drawing and automatic generation of bar, area, line, and pie charts. Its one important drawback is that it can't print in color. (Computer Graphics Group, Inc., 562 14th St. NW, Atlanta, GA 30318; 404-876-9469)

Kicking the High-Cost Habit

Given the under-\$100 price of desktop managers such as **SideKick** and the **Bellsoft Pops**, any of these programs can fit into a low-budget office. But **PC-Desk**, in particular, is certainly worth a serious look.

Features on **PC-Desk** include a calendar, an on-screen clock, an appointment reminder, a four-function memory calculator, an automatic dialer, and a 100-line text processor, suitable for writing letters. Unlike **SideKick**, though, **PC-Desk** is not memory resident. What's more, it is built around a database function. With **PC-Desk**, you work from a sort of electronic Rolodex, from which you can print envelopes, send letters, or search and sort records.

PC-Desk is a shareware product. You can get a copy for free from a bulletin board, then pay the \$25 for it only if you like it. Registered users get telephone support and updates as they become available. **PC-Desk II**, a memory-resident update, is available for \$49. (Software Studios, Inc., 8516 Sugar Bush Court, Annandale, VA 22003; 703-978-3524)—M. David Stone

fiers the convenience of multiple open documents.

Perfect Writer's environment format commands and document-sectioning facilities yield a lot of flexibility and power in the design of complex reports and manuscripts. You can produce numbered outlines, multiple heading levels, indexed documents, and more with a series of commands that are planted in the text preceded by the at sign (@). Powerful, yes, but by no means simple to learn or remember.

Perfect Writer comes with a thesaurus and spelling checker, and those items add a lot of value to the package. Both come on separate disks, which makes them best suited for a hard disk system. But even with the disk switching, both programs are worth it because they are easy to use.

TEXTRA

Extra Speed and Extra Saving

It may be difficult to believe that a \$10 program can keep up with those costing several hundred dollars, but **Textra** does. **Textra** seems to be the bargain of the century in word processing for the PC, especially since its reduction in price from \$49.95 to only \$9.95 to make way for a new version at the old price. It is one of the fastest word processors on the market, competing with the likes of **XyWrite** in file handling, command execution, and reformatting.

The program boots quickly to an opening menu with a delicious assortment of goodies. The files of the default drive are presented in a numbered list, and with a press of the F5 key and a letter A through D, you can log onto another drive and have its files listed. To bring up a file, all you need to do is type its number and press Return. All programs should work this way.

The writing screen is blank except for the bottom line, which contains the func-

PC FACT FILE



Textra
Ann Arbor Software
407 N. Main
Ann Arbor, MI 48104
(313) 769-9088
List Price: \$9.95
Requires: 128K RAM,
one disk drive

CIRCLE 668 ON READER SERVICE CARD

tion-key prompts. This configuration gives you a lot of room and an uncluttered look. You can invoke two menus, during writing or editing with the F1 key acting as a toggle switch between them. The main-menu function keys handle such tasks as inserting blank lines, highlighting and deleting blocks of text, and reformatting paragraphs that have uneven lines after editing.

A submenu assigns the function keys to the search, replace, copy, move, and merge commands. Several keys lead to two other extremely useful menu screens. One is called Switch because it allows you to change nine on/off toggle switches for features such as automatic indent, word wrap, error beeps, and a green display screen. Three other switches let you change the margin setting and initial paragraph line indents.

Yet another function key takes you directly from your document onto a full-screen print menu with a decent assortment of options, though nothing particularly fancy. Here you can set line spacing, pause, time and date stamp your document, print the current document or one from disk, select pages or lines to be printed, and add headers and footers.

A third submenu allows you to save your document under the current name or a different one, on the default drive or another drive, and either with or without control characters. Through this menu you can also abandon the file by retrieving another file.

The excellent on-line help is context sensitive, so if you're trying to do a block move command and type Alt-H for help you will receive information on performing a block move.

All in all, *Textra* is a steal for the price. Some of its limitations may make it unsuitable for serious business work, particularly the 30- to 40-page document size limit and the vanilla formatting. But in a pinch, this is a great word processor. And for \$9.95, everyone should have one. The files it creates are nearly completely ASCII anyway, so you can use them with other fancier programs.

Phil Wiswell is a software critic whose column, The Short Report, appears in PC Magazine.

The screenshot shows the Textra word processor interface. At the top, there's a title bar that says "Textra". Below it, a menu bar contains "File", "Edit", "Format", "Window", and "Help". The main window displays a document with several lines of text. A search-and-replace dialog box is open, showing a list of options: "Enter replacement", "Exit", "Search", "Ignore case", "Same string", and "Advanced". The "Search" option is highlighted.

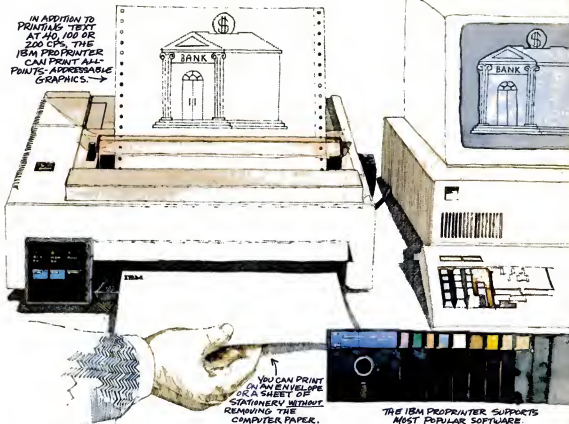
Textra has many menus for the function keys that replace one another as needed. For example, selecting the search-and-replace function brings up a new menu of options.

Word Processing Values

	Display-Write 1	Executive Writer	PC-Write	PFS: WRITE	Perfect Writer	Textra
Price	\$95	\$89.95	\$85*	\$140	\$109.95	\$9.95
On-screen formatting	yes	yes	no	yes	no	yes
Multiple line headers/footers	no	yes	yes	yes	yes	no
Automatic text reformatting	no	no	no	yes	no	no
Undelete	no	yes	yes	no	yes	yes
Copy/move blocks between files	yes	yes	yes	yes	yes	yes
Use files from any subdirectory	yes	no	yes	yes	yes	no
Automatic backup	no	yes	yes	no	yes	yes
Mail merge	no	no	yes	yes	yes	no

*\$10 for disk, \$75 for registration.

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AT 40, 100 OR
200 CPS, THE
IBM PROPRINTER
CAN PRINT ALL-
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Built to take it. Priced to take it with you. The new Proprinter from IBM.

There's just one thing that's as remarkable as the rugged reliability of our newest personal printer—and that's its price. Under \$550.

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Yet the IBM Proprinter is a full-featured machine. It has three printing speeds to give you everything from fast first drafts to sharp, near-letter-quality correspondence. It takes perforated

computer paper for long jobs and—without removing the paper—will easily print on a sheet of stationery or an envelope, thanks to a handy slot in front.

With its all-points-addressable graphics and its comprehensive character set, the IBM Proprinter supports most popular software.

The new Proprinter attaches to every IBM PC and to other leading personal computers. And it's just part of our growing family of personal printers. All are

designed to serve a single purpose: To give everything you do the finishing touch.

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IBM

IBM Personal Printers...The Finishing Touch

Full-featured, high-powered database management systems don't always have high price tags to match, as the four programs reviewed here prove. Each one pairs a moderate price with an attractive array of features and as much flexibility as most users will ever need.



COST-EFFECTIVE DATABASE MANAGEMENT

The marketplace is full of database management programs that cost hundreds of dollars and users who wonder why software is so expensive. Manufacturers typically refer to "development costs" and "production expense" to justify their high prices, but the truth is that many users actually *want* to spend a lot of money for software. They're afraid that if they don't pay a king's ransom for the program that will store their business's mailing list and client records, they may end up with a lemon that will make data management more, not less, of a headache or that will eat all of their data.

To some extent, the success of expensive programs is well deserved; none of the database management programs described here present much of a threat to the popular and powerful *dBASE III* or *Knowledge-Manager* in terms of flexibility or sophistication. On the other hand, you can easily find some valuable alternatives in the under-\$200 price range without giving up production quality, sophistication, or ease

of use. Most inexpensive programs have their own combinations of strengths (and weaknesses) that could make them just the right shape to plug a data processing hole you need to fill.

Despite their low prices, the database programs reviewed here have many powerful features that make them very attractive for serious applications in a business setting. More and more databases with under-\$200 price tags are becoming available, and these four represent some of the best in the class.



PC-FILE III VERSION 3.0

A New Version of an Old Friend

PC-File, a user-supported program, has always been a class act. Jim Button, the program's well-known developer, was one of the pioneers of the shareware philosophy and certainly some of his success can be attributed to *PC-File*'s popularity. The latest version of the product is significantly better than the earlier ones, adding features that are not available on some programs costing ten times as much.

PC-File has a clean, clear way of letting you know what you can do next. It has always been fast, and the new version, which uses all the PC's available memory, is faster still. *PC-File* has always made good use of the IBM PC's function keys, and the new version enhances this feature, particularly in the field-definition screens.

Reports are flexible and easy to set up, and you can store them for reuse at another time. In earlier versions of *PC-File* you could create mailing labels and reports with subtotals. Now, in addition, you can print sheets of mailing labels, and you can force page breaks after subtotals. A "transpose" character (the tilde) permits you to maintain your mailing list in order by last name, but it also automatically switches the places of the first and last names when you print letters or reports.

The latest version of *PC-File* features two new capabilities that are truly outstanding. The first is a new field-type, the superfield, which lets you assign the rest of the available screen space as a free-form text field. With a typical four-line mailing label, you would still have room for more than 1,000 characters in the new superfield. True, there is no word wrap in this



**EDITOR'S
CHOICE**

Two database managers stand out above the rest: **PC-File III**, Jim Button's extraordinary shareware product, and the latest version of **VersaForm XL**. *PC-File III* offers data import and export, encryption, "soundex" and in-field searches, mailing labels, macro keys, and so much more. You can legitimately obtain a free copy to evaluate from anyone who has a copy to give you; you pay only when you decide that the program is worth it. And the registered price of \$49 includes a current copy of the disk and an attractive typeset manual.

The latest version of *VersaForm XL* deserves special praise. While it is not the easiest program to work with at times, it can handle multiple lines, such as the listing of items purchased on an invoice. It also has a procedural language that can perform lookups between files, calculate extensions and totals, and even create custom menus so that novice users can perform complex operations without extensive training. At \$99, it offers unmatched power for the price.

mode, but you can't have everything. Unlike the memo fields of *dBASE III*, you can use a contained-string search to find records that contain a given word anywhere within the superfield. This memo feature can be of great help when storing bibliographic data and similar applications.

The other new capability is the "snapshot" mailing label. Have you ever called up a customer's name on the screen and wished you could dump the address to the printer for an envelope or mailing label? *PC-File III* can do it. You must predefine the label format, but the program will take it from there.

Of course, *PC-File III* still contains all the standard *PC-File* features in addition to this bonanza of new ones. You can search for records using exact matches, "begins with," wildcards, or a "soundex" algorithm (which lets you mangle the spelling of your target and still find it. Ask it to find *Ronold Raygunn* in your list of presidents, and *PC-File* will succeed).

PC-File III also has a full complement of data import and export features. It will handle ASCII text files (fixed-length) with records delimited by carriage returns, fixed-length without record delimiters, quoted strings with comma delimiters between fields and carriage returns between



PC-File III can find a record even when you misspell a word. The "soundex search" can match *Portrad* (see inset with original search request) to *Portrait* and retrieve the correct title.

PC FACT FILE



PC-File III, Version 3.0

Buttonware
P.O. Box 5786
Bellevue, WA 98006
(206) 746-4296
List Price: \$49.95
Requires: 128K RAM,
one disk drive.

CIRCLE 682 ON READER SERVICE CARD

records, DIF format, and a special format for *PC-Calc* (also from ButtonWare). You can also write your own BASIC programs to access the data files themselves; a sample program that you can adapt to your own needs is provided.

These are only a few of *PC-File III*'s charms. Others, in brief, include date and time stamping, duplication keys, encrypting files for secrecy, and fast search processes. *PC-File III* is a fully loaded program and probably the best bargain in the bunch.

VERSAFORM XL VERSION 3.12

Basic Power and Flexible Reporting

VersaForm XL from Applied Software Technology is proof that sophisticated software need not be expensive. This package is capable of multiple access for table lookups and reporting, and it also includes an extensive procedural language. This program is a little like your old red bike with the balloon tires and chrome-trimmed frame; it is not all that elegant or state-of-the-art, but it can get you just

about anywhere that the 10-speeds can go.

VersaForm has a broad collection of features. You paint the data entry form on-screen, and then you define the various attributes for the different fields. You can specify that an entry in a field have a minimum and/or maximum length, that some entry is required, and that it be a data, a numeric, or a "yes-no" field. You can create a short list (up to 99 items) of values to be used for verification or for table lookups. You can specify a range of values and even a limited edit mask showing which positions can contain letters and which can contain digits. You can even define a field as containing the results of calculations based on one or more other fields.

VersaForm deals comfortably with columns of input for a single record. You may have more than one detail line on an invoice form, but you don't have to commit

to a given number of lines when you define the screen. *VersaForm* will add the lines as you go. You can define a field as the total of all the values in a given column so that you can get a total amount for your invoice, all on one screen.

As its name implies, the program provides great flexibility in reporting. It can do three-level sorts and subtotals, and you can request that up to nine separate conditions be met (each with up to three criteria). Best of all, *VersaForm* is designed to format its reports for preprinted forms. It will even output a print-position grid on your form to help you develop the format to fill in the blanks, thus allowing you to continue to use your current forms.

VersaForm's crowning feature is its procedural language. You can write procedures for custom menus, data entry prompts, automatic filling and calculations, and more. With *VersaForm*, you can create applications that will automatically load and execute so that inexperienced staff members can perform complex operations with only minimal training.

VersaForm does have some drawbacks, however. The user interface in the interactive mode is cryptic at best, and the on-line help is limited. The method of creating procedure files is not intuitive for me; I prefer something that looks more like programming (or more like filling in the blanks). The manual is divided into two sections (plus two on-disk updates). This can be confusing when you are trying to learn the program.

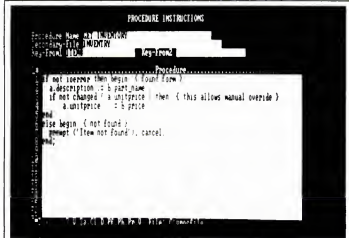
Overall, *VersaForm XL* represents a significant value. For less than \$100, you get the tools required to create complete and serious business database applications. If you are prepared to work hard at this one, it will reward you with useful results.

PC FACT FILE



VersaForm XL, Version 3.12
Applied Software Technology
1350 Dell Ave., Suite 206
Campbell, CA 95008
(408) 370-2662
List Price: \$99
Requires: 192K RAM, two disk drives, DOS 2.0 or later.

CIRCLE 663 ON READER SERVICE CARD



VersaForm XL is one of the least expensive programs to offer a procedural language. You don't use a text editor to create procedure files; you create them on forms.

FORMMANAGER VERSION 1.5

Macros Add Calculation Power

BIT Software's *FormManager* is an attractive program with some interesting features, most noticeably its packaging, which shows that low-budget production doesn't have to mean low quality. The

three-ring binder comes in a traditional IBM linen-covered slipcase and contains a typeset manual and two keyboard templates. Granted, the printing is not terrific and the cardboard templates aren't as elegant as the sculpted 1-2-3 and *Framework* models, but they get the job done with a certain amount of class.

The program makes good use of the IBM PC's function keys, and it takes advantage of Alt and number-key combinations to create another ten command keys. The keyboard templates help you find the commands you need quickly.

Many of the commands relate to the forms editor section of the program. You can paint your data-entry forms on-screen and then easily duplicate, move, and erase blocks. You can also define a block and, at the touch of a function key, draw a box around it. As a result, you can quickly produce professional and crisp entry screens.

You define fields in this same program module, and there is plenty of flexibility here as well. You can define a field to be replicated over multiple lines on the same form. You can specify any one of eight data field types, as well as data validation features such as minimum/maximum, range check, default value, seven attributes, plus switches for autocexit and auto-date. This capability cuts down on errors during data entry.

FormManager includes some flexible report-formatting capabilities, such as the option to create and store both standard columnar formats and form-oriented label formats as well. You can specify up to three fields for sorting along with selection criteria. Reports can also include totals, averages, and counts for both subgroups and the total report.

Another useful feature is an on-line calculator. You can also put a field name in the expression, and *FormManager* will

use the value contained in that field in the current record for the calculation. You can also predefine calculations in macros, which comprise the beginning of a procedural language. These macros can be used to perform calculations, test for conditions, perform repetitive or incremental operations, handle string functions, and even branch to different sections of the macro.

FormManager's flaws are primarily problems with the user interface. The program just doesn't hang together well as a unit. You enter the different modules through the use of DOS batch files (1.BAT, 2.BAT, and so on). Once you get inside a module, you find that the templates show different keys that perform the same function, and you have to figure out which module you are in and which key to press. For example, Alt-I is the EXIT command for the data file manager section, but in the forms editor section, Alt-O is assigned to that function.

FormManager is worth a look, however, if you want to work with a single file at a time and want to play around with automating some complex calculations. There are other programs that are easier to use, but this one offsets its difficulties by offering some important features.

PC-FILE'N REPORT VERSION 4.1

Database Diamond in the Rough

When I reviewed *PC-File 'N Report* last year for Project: Database, JASPIR International had priced it at \$195, and I had it pegged as a diamond in the rough. It had some nifty features, but it was too cumbersome to work with and the manual would push even the calmest soul dangerously close to chronic high blood pressure.

The new version, priced at barely 30 percent of the original cost, is better than ever. If there is ever an award given for Most Improved Manual, *PC-File 'N Report* would be a top candidate. The new documentation is typeset, professionally produced with a binder and slipcase, and reorganized. The writing is still a bit fuzzy and the index is almost useless, but you stand a better-than-even chance now of finding the information you need.

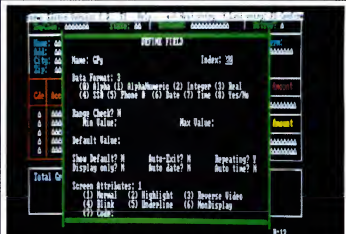
A number of features in *PC-File 'N Report* stand out. It has some powerful table-lookup features that can be used to verify and retrieve data. The process can be based on exact matches between a pair of fields, data falling in a range as defined by two

PC FILE'N REPORT



FormManager, Version 1.5
BIT Software
1048 Nicklaus Ave.
Milpitas, CA 95035
(408) 262-1054
List Price: \$195

Requires: 256K RAM, two disk drives, DOS 1.1 or later.



FormManager uses a window to enter field definition data during data entry screen creation. Line graphics are made by highlighting a block and pressing a function key.

fields in the lookup file, and matches based on two pairs of fields.

The program has flexible report-formatting capabilities, including both columnar and label/form report format styles. This latest version has added the

ability to create mailing label formats for up to nine labels per row on the sheet.

The most interesting feature, however, is *PC-File 'N Report's* memo and letter facilities. You can create memos and form letters with this program and then merge

them with data from the database to create custom correspondence. Granted, *PC-File 'N Report* will never be confused with a text editor, but if you need to use form letters and you are on a tight budget, this package may fill the bill.

Some of the problems with the package continue to be centered on the user interface. When inquiring about individual records in a database, the bottom line of the screen reads:

?/n/A/B/C/D/F/N/P/S/T/TX/X/U/:

This statement conveys a wealth of intuitive information. Few of the function keys are active, which is unfortunate since many of the commands could be handled by assigning them to function keys and providing a template. Other annoying features are the fact that almost all commands and responses must be entered in uppercase and nearly every command is followed with a prompt to press G to proceed and Z to quit. This is confusing at times (you press Z to "quit" exiting the program, which means returning to it) and useless at other times (sometimes pressing G and Z has the same effect).

PC-File 'N Report lacks some of the automating features that other packages offer, but it stands out in its ability to create merged letters and perform useful table-lookups and calculations. This package will certainly do most of the tasks that most people will require of their database management program. *PC-File 'N Report* is a little difficult to master, and the lack of procedure files means that you must continually reenter command sequences to repeat the same activities, but at this price, it may well be worth the effort. ■

Alfred Poor is a principal of Soft Industries, a microcomputer consulting firm in Southington, Connecticut.

PC FILE



PC-File 'N Report, Version 4.1
JASPIR International, Inc.
24 Salrit Ave.
Waldwick, NJ 07463
(201) 445-8535
Price: \$59
Requires: 96K RAM, one disk drive, DOS 2.0 or later.

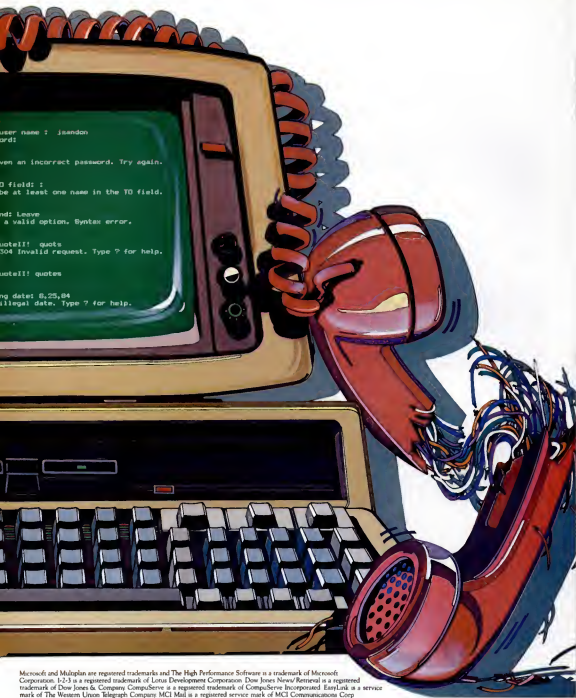
CIRCLE 681 ON READER SERVICE CARD

STYLE	QTY/PCS	DESCRIPTION	RATE	AMOUNT
(1200)	25	T-SHIRT 1/4 IN. W/WHITE STRIPE	2.50	62.50
(1200)	100	T-SHIRT 1/4 IN. W/WHITE STRIPE	0.50	50.00
(1200)	25	T-SHIRT 1/4 IN. W/WHITE STRIPE (25)	2.50	62.50
(1200)	100	T-SHIRT 1/4 IN. W/WHITE STRIPE (100)	150.00	1500.00
(1200)	2000	T-SHIRT 1/4 IN. W/WHITE STRIPE (2000)	.05	100.00
TOTAL.....			2407.25	
TAX.....			76.93	
TOTAL-INC.....			2564.20	

PC-File 'N Report demonstrates here its table lookup and calculation capabilities that make the program particularly well suited for form-based applications.

Low-Cost Database Overview

	PC-File III	VersaForm XL	Form Manager	PC File 'N Report
Database Category	1	3	1	2
Price	\$49.95	\$99	\$195	\$59
Max. files open at once				
in report	1	unlimited	1	1
Number of field types	4	5	8	4
Table lookups	no	yes	no	yes
Custom menus	no	yes	no	no
Procedure files	no	yes	macros	no
Stored report formats	yes	yes	yes	yes
Mailing labels	yes	yes	yes	yes
Data import/export	both	export only	neither	both
Copy protected	no	no	no	no



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Enter Microsoft[®] Access. The communications program that'll beam you straight through. No begging. No waiting. No fooling.

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The path is easy, fast, consistent.

Access' custom menus replace those reams of documentation that read like Adventures in Latin. They walk you through the database, step by step. So there's no on-the-job-training while the meter is running.

With Access, you dial in, pull out the facts and log off. End of transaction.

Your mail is in the specs.

Access' built-in electronic mail facility gives you a simple, economical route to compose, send and receive messages on MCI

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It gives you one easily digestible menu for all electronic mail carriers. It lets you compose off-line. And lets you send the same message without recomposing it for each service.

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Access. You'll swear by it. Not at it.

Microsoft Access
The High Performance Software[™]

You don't have to approve a massive outlay of funds to afford good general ledger software. The following programs combine low prices with such essential accounting features as accounts payable, accounts receivable, and report writing.



TAKING YOUR BUDGET INTO ACCOUNT

The basic process of bookkeeping has not changed much over the last 100 years. Except for the development of a few forms-and-format twists in manual bookkeeping systems, it took the introduction of the computer to truly revolutionize accounting. The time needed to maintain these records decreased dramatically, allowing accountants to maintain extensive records and prepare elaborate reports.

The personal computer has further broadened automation's impact on the accounting process. Indeed, some of the software reviewed in past issues of *PC Magazine* rivals that found on larger minicomputers at many times the price. Still, can you buy low-cost accounting software that will meet your needs? If your needs are basic, we think you can. PC-based accounting software now boasts impressive functionality, and the prices continue to fall.

Inexpensive packages aren't necessarily weak packages. Many simply offer fewer features than their well-heeled coun-

terparts and focus on the broadest of accounting problems: general ledger, accounts payable, and accounts receivable. Most programs limit the number of accounts you can maintain and the reports that are available. Yet many of the low-cost packages cover the basics well, providing automatic installation routines, menus, audit trails, reliable error trapping, full-screen data entry, and an automatic interface to the general ledger. If you're not looking for a 100 percent solution to your needs, an inexpensive package may fit the bill.



PC-GENERAL LEDGER

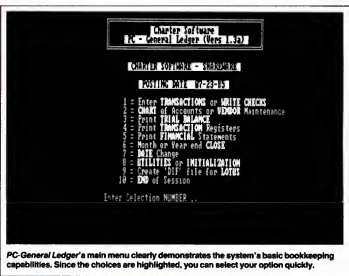
Covering the Basics

In the tradition of "the best things in life are free," Charter Software offers you one of the greatest bargains in software. *PC-General Ledger (PC GL)*, a computerized one-write system, gives you basic general ledger bookkeeping with a check-writing function thrown in. The software is free, and you're encouraged to give copies to other people. You are, however, also encouraged to register your copy by sending \$50 to the author. In return, you get the most recent manual, telephone support, and all updates and enhancements as they become available. There's another catch—if you choose not to "donate" the \$50, the program won't let you place your company's name on your reports.

PC GL comes on a single floppy disk that includes the software and a 19-page manual. The main menu presents the capabilities of the entire system clearly with the key words of each menu choice highlighted for fast identification.

The chart of accounts employs four-digit account codes and predefined ranges to group accounts in the traditional manner (current assets, current liabilities, and so on). The system maintains the account number, description, month-to-date balance, and year-to-date balance. You can have up to 500 account numbers.

Once you've entered your chart, the system operates much like a manual one-write system. You can enter cash receipt, check stub, or journal entry data. For each transaction, you enter the amounts (debit and credit), the financial accounts, the posting date, a description, and a "memo" reference. When entering cash



PC-General Ledger's main menu clearly demonstrates the system's basic bookkeeping capabilities. Since the choices are highlighted, you can select your option quickly.



Dac-Easy stands out from the crowd for several reasons. It's simple to learn and to use. It includes all the basics you'd want in an accounting package, yet it doesn't take up much room, which means you can run it on a floppy system. A lot of people still have floppy systems, and it's rare to find a complete accounting system they can run. And despite its low price, Dac-Easy includes a lot of extras, such as inventory and receivable sorts, that you wouldn't expect to find even in a more expensive package.

receipts or disbursement data, the appropriate account will default to your cash account. Disbursements can be entered after the fact (manual checks) or as data required for checks produced by the system. *PC GL* maintains three lines of vendors names and addresses (accessed by vendor name) to speed the entry of checks.

Each transaction type appears in a corresponding journal report that prints the detail and posts the information to the chart of accounts. The reports all have the same format, and they list all transactions since the last posting. Once you have printed the

journals, you can print a summary or detail trial balance and create financial statements based on the predefined ranges in the chart of accounts.

Many of the reports can be directed to your screen or to the printer. The screens are relatively clear and fast, speeding your entry of journal transactions, and you can move from menu to menu with ease.

In general, *PC GL* allows you to enter, organize, and print enough information to get the job done. The system does, of course, have its limitations. For instance, you may need more than the three lines allowed for your vendors' names and addresses. Some reports could be easier to read were they formatted more clearly—an inconvenience but not a fatal flaw.

Who could use *PC GL* effectively? Any business that has very basic bookkeeping and reporting requirements, makes a limited number of transactions, and can live with the four-digit chart-of-account structure could probably benefit from the package. We work with some relatively large businesses that could use *PC GL* to account for their small subsidiaries. Certainly anyone who is now using a manual one-write system would like *PC GL*. The authors have done a fine job. Have a look at it—and, if you use it, register!

PC



PC-General Ledger
Charter Software
P.O. Box 70
Monticello, IL 61856
(217) 762-7143
List Price: free
(\$50 registration fee)
Requires: 128K RAM,
two disk drives.

CIRCLE 684 ON READER SERVICE CARD

DAC-EASY

Standard Accounting plus Forecasting

It's hard to ignore a package that sells for \$49.95 and includes modules for general ledger, accounts payable, accounts receivable, inventory control/purchasing, billing, and forecasting. We were expecting a simple manual and one floppy disk, but *Dac-Easy* boasts a list of features that rivals those of much more expensive packages. The manual, for example, comes in the typical hardcover slipcase-style binder. The text is surprisingly complete and includes a "Tips by DAC" section to help you through difficult procedures.

The general ledger employs a six-character alphanumeric account number. As you create accounts, you specify a level code that allows up to four levels of totals and subtotals. In establishing each account, you can enter historical information for the last 2 years, this year's current balance, and the current budget. You enter transactions into the system by assigning them to a journal and then entering debits and credits until the transaction balances. After posting, you can produce a journal list, a general ledger, a trial balance, and

custom financial statements.

The accounts receivable and accounts payable modules mirror one another. The screens used to enter and maintain customers, customer invoices, and cash receipts differ only slightly from the screens for vendors, vendor invoices, and manual payments.

Once you've created customer and vendor accounts, you enter basic transaction information daily, along with the appropriate general ledger distribution. You can then post the transactions to the open invoice file and print a journal. You can create statements, an aging report, and labels. The accounts payable module, of course, has an option that allows you to print checks and a corresponding check register.

Dac-Easy uses similar screens and menus within its purchasing and billing modules, both of which rely on your inventory file. The purchasing and billing systems let you enter transactions daily to update inventory and generate purchase orders and invoices. We were impressed with how complete these functions were. The purchasing module lets you print purchase orders, returns, and a purchase journal. The billing module creates invoices, sales returns (credit memos), and a sales journal. A posting routine updates the in-

ventory, accounts receivable, and the general ledger systems.

Inventory reports allow you to sort your inventory information by product number, description, product type, bin number, or vendor, and you can select all items or just a range of items. In addition, you can sort these items in nine different ways. You can report all the ranked items or just a range within the ranking. You can print a product listing, a price list, an activity report with quantity, sales, cost, purchases, turns, and profit information, and an inventory alert report that indicates items below a minimum quantity.

A forecasting module is a feature seldom seen even in expensive accounting packages. *Dac-Easy's* module uses the budget information that you enter for ledger accounts, customers, vendors, and inventory items to print forecasts and statistical reports. You can create forecasts based on last year's actual amounts, last year's actual plus a percentage, last year's actual plus the trend for the last 2 years, or a trend of the last 3 years using the least-squares method of calculation. Some of these capabilities may be a bit overpowering for those likely to use this system.

All these features for \$49.95 may sound too good to be true, but *Dac-Easy* is a genuinely amazing deal. It does have a few gaps: You can't edit transactions, for example. You have to cancel an entire transaction when you make a mistake. When you make an obvious error in entering data, the system simply beeps at you—no error message is displayed. The "trouble shooting guide" that comes with the software warns that you can inadvertently delete master records after a transaction has been entered. This erasure may cause a "Missing Record" error, forcing you to restore the system from a backup.

PC



Dac-Easy
DAC Software Inc.
4801 Spring Valley Rd.,
Suite 110B
Dallas, TX 75244
(214) 458-0038
List Price: \$69.95
Requires: 128K RAM,
DOS 2.0 or later,
one disk drive.

CIRCLE 685 ON READER SERVICE CARD

DAC EASY ACCOUNTING MAIN MENU

1. FILE UTILITIES
2. GENERAL LEDGER
3. ACCOUNTS RECEIVABLE
4. ACCOUNTS PAYABLE
5. PURCHASE ORDERS
6. BILLING
7. INVENTORY
8. REPORTS
9. FORECASTING
10. END PERIOD ROUTINES
11. FILE CREATION AND MAINTENANCE
99. EXIT TO DOS

ENTER YOUR SELECTION:

Dac-Easy is easy to learn and use. As the main menu suggests, the program provides both basic features and several extras, such as inventory and receivable sorts.

IN-HOUSE ACCOUNTANT

The Art of Reporting

If you're looking for a simple general ledger package with some neat reporting options, the *In-House Accountant (IHA)* may be for you. For \$179.95, *IHA* includes most standard general ledger features, along with budgeting, a context-sensitive help function, color screen, a DIF-file creation facility, pie chart and bar/trend analysis, and flexible report writing.

IHA comes in a standard slipcase cover binder with the user manual and two program diskettes. The manual is well organized and includes sections, such as "Helpful Hints on Accounts" and "Helpful Hints on Transactions," that help in setting up your chart of accounts and in creating journal entries.

IHA allows a maximum of 250 accounts: once established, these accounts cannot be deleted. It is important that you plan ahead. Account number ranges are predefined; you must adhere to these ranges for proper report generation.

When making journal entries, you are allowed distributions to up to eight accounts. Journal entries may be by account number or account name, and they must balance before the software can record them. Each one is posted to the general ledger immediately. You can generate activity reports and use them as customer statements as well as transaction listings. *IHA* also has a check-printing function. However, it has no automatic means of preventing you from producing the same check twice! Also, multiple payment requests for the same payee will not be combined into a single check.

IHA's financial reports include a de-

tailed and summary-level income statement and balance sheet along with a trial balance. Reports can be sent to your printer, screen, or disk and can be queued to run one after the other. You can edit report formats, defining four header and four footer lines. You can compare current, previous, and budgeted amounts for any range of months. Your reports can be produced with or without penny amounts. If your PC has a color/graphics board, you can produce pie charts and bar/trend graphs based on account ranges that you define.

IHA includes other useful utilities such as a function that allows you to select and print mailing lists and labels from your master name and address file. The *IHA* manual's "Helpful Hints on Transactions" section describes a method for using the name field on journal entries to track amounts you owe to vendors and amounts your customers owe you. However, don't confuse this limited function with a complete accounts payable or accounts receivable feature.

Like any low-cost package, *IHA* does have certain drawbacks. We found a few minor errors and omissions in the documentation. Entry of invalid data often results in a beep with no error message, and, as with most low-end accounting pack-

ages, *IHA* has no password security.

IHA is a clear and concise general ledger with a good audit trail and better-than-expected reporting flexibility. If you are looking for multiformat financial statement presentation, it is worth a look.

ACCOUNTING FOR MICROS

A Little Inflexible

If you're after a low-cost general ledger, you'll want to include *Accounting for Micros (AFM)* in your search. This program is a simple yet capable general ledger accounting solution for very small businesses. At \$125, the *AFM* general ledger is a great value, particularly if this is your first attempt at automating your bookkeeping chores. *AFM's* documentation is clear, concise, and geared toward the novice.

System setup is very easy; you should have it up and running in a few hours. The installation and setup procedures allow you to enter general ledger accounts and their balances by month for both the previous and current year's "actuals" and the current year's budget. You can count on storing up to 500 accounts and 1,000 trans-

THE IN-HOUSE ACCOUNTANT

MAIN MENU

1. TRANSACTIONS
2. FINANCIAL STATEMENTS AND GRAPHS
3. NAMES
4. ACCOUNTS
5. UTILITIES & START NEW SYSTEM
6. EXIT

ENTER SELECTION (1-6)

EXIT

In-House Accountant includes most standard general ledger features, budgeting options, pie chart and bar/trend analysis, and flexible report writing.

PC

IN-HOUSE ACCOUNTANT

In-House Accountant
1880 Century Park East,
Suite 311
Los Angeles, CA 90067
(213) 556-2211
List Price: \$179.95
Requires: 192K RAM,
DOS 2.0 or later,
two disk drives.

CIRCLE 686 ON READER SERVICE CARD



Although it does not offer a user-defined financial report writer, *Accounting for Micros* is a simple and functional general ledger accounting solution for small businesses.

A Chart of Accounts

Package Name	Strengths	Weaknesses
PC-General Ledger \$50*	<ul style="list-style-type: none"> • Responsive support • Reports to printer or screen • It's free 	<ul style="list-style-type: none"> • Three-line input for vendor names • Cluttered reports • Predefined ranges in chart of accounts
Dec-Easy \$69.95	<ul style="list-style-type: none"> • Full-featured general ledger, accounts payable, accounts receivable, inventory, and billing • Modules are integrated • Can create statistical/forecasting reports 	<ul style="list-style-type: none"> • Can't edit transactions • Few error messages • Can accidentally delete master records that have period data
In-House Accountant \$179.95	<ul style="list-style-type: none"> • Flexible report writer • Data export facility for spreadsheets and other applications • Pie chart and bar trend graphs 	<ul style="list-style-type: none"> • Minor documentation errors • Few error messages • No password security
Accounting for Micros \$125	<ul style="list-style-type: none"> • Simple installation • Excellent documentation • Easy to use 	<ul style="list-style-type: none"> • No report writer • Limited to ten-line journal entry • No password security

*Package is free, but there is a \$50 registration fee

actions if you have a dual-drive machine.

Although the system accommodates an account code of up to five digits, the numbers entered must be smaller than 32,000. As you establish each account, you must assign it to one of ten predefined groupings, such as current assets, fixed assets, or current liabilities. When sorted, the account numbers and groupings cannot be in an inconsistent order.

You enter transactions through one of three journals: cash disbursements, cash receipts, and the general journal. Journal entries are batched and must balance to be posted. Since the program has no screen-scrolling function, batches are limited to ten lines.

AFM reports include transaction listings, a balance sheet, an income statement, and monthly summaries for this year's and last year's amounts and budget. No financial report writer facility is included. However, for a fee of \$20 per file, you can obtain the specifications for the system's file structures in order to develop custom programs that access the data within your general ledger files.

Accounts payable, accounts receivable, inventory, and payroll modules are available from the James River Group, at \$125 each, for use with the general ledger. (Discounts are available if you purchase three or more modules at one time.)

Overall, *AFM* is well designed for the computer accounting novice. The documentation and screens are clear and uncluttered. If your needs are simple, *AFM* is well worth a look—and by purchasing a demo disk for \$18, you can take it out for a test drive. ■

Mike Falkner is a manager, Pat Fitzhenry is a senior consultant, and G. William Dauphinais is an MCS partner in Price Waterhouse's office in Sacramento, California.



Accounting for Micros
James River Group
125 N. First St.
Minneapolis, MN 55401
(612) 339-2521
List Price: \$125
Requires: 128K RAM,
two disk drives.

CIRCLE 607 ON READER SERVICE CARD

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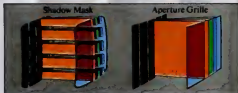
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QIC-03 300/1200 Baud Modems



Our modems are fully Hayes compatible with features such as low heat dissipation, low power consumption, software volume control for the speaker, and large-scale integration "Modem on a chip" for high reliability. It also comes with communications software which lets you emulate VT100 or IBM 3101. Half size Internal \$299

QIC-05 Multifunction Card



It gives you more than just added memory. It gives you reliable memory expansion (up to 384K), a serial port, a parallel port, a game port, and a battery back-up clock calendar. Includes RAM disk, print spooler, and clock utilities. (The 64K RAM set is only \$15.) With 2 serial ports \$175.

QIC-200 External Hard Disk with Tape Backup.



Here's a 20 MB hard disk with a 20 MB tape backup unit in a chassis with two extra I/O slots. Comes with cable and a half size host adapter card. 20 MB hard disk with 60 MB tape is only \$2450.

QIC-02 10, 20, 60 MB Half-Height Tape Back-up Systems

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20 MB cassette and 60 MB cartridge back-up systems come with controller, cables and drive. Back-up 20 MB in 6 minutes. You can even do fast Image Back-up and then file-by-file retrieval. Works on IBM PC, XT or AT. Internal 10 MB \$499, 20 MB \$699, 60 MB \$899. External 10 MB \$675, 20 MB \$875, 60 MB \$995.

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Color Graphics Card	\$125
Everex Graphics Edge	\$295

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384K	\$175
576K	\$225

I/O card with 2 serial ports,
1 parallel port, clock/calendar.

Internal Power Supply	
135 Watt	\$ 99
150 Watt	\$115

Expansion Chassis with	
I/O Slots	\$695
IBM PC, 256K, 1 Drive	\$1499

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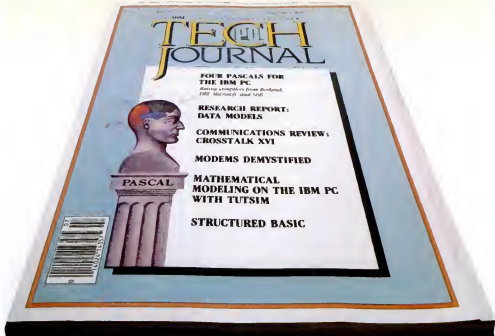
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Milpitas, Ca 95035

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8Z383

These four low-cost spreadsheets—ranging from a Microsoft perennial to some unknown newcomers—lack the frills you'd get with Lotus's 1-2-3, but they'll calculate your formulas faithfully while working wonders for your software budget.



THE BOTTOM LINE ON SPREADSHEETS

Although Lotus's 1-2-3 is the most popular spreadsheet on the market, it may not be the right package for you. First of all, it's expensive. It lists for \$495, although you can order it by mail for less than \$300. And it's complex; most users barely scratch the surface of its capabilities. For a lot less money—as little as \$19.95—you can get a worthwhile spreadsheet program that, while it won't give you all the power of 1-2-3, may give you what you need for the tasks at hand.

If you do decide to go ahead and settle for a spreadsheet that costs under \$200, be forewarned that you'll have to sacrifice some features and put up with some shortcomings. For instance, none of the programs I tested include macros or database management. None of them can produce real graphs, and only *Multiplan* handles named cell ranges. With the exception of *Number Works* (which has other limitations), none of the tested packages have a workspace greater than 255 rows by 64 columns. *My Calc*'s skimpy 34-page man-

ual doesn't even have an index, and *Magic Worksheet* is prone to frequent crashes.

Even with those drawbacks, all these programs offer quite a lot for the amount of money they cost. They use sophisticated mathematical functions, keep track of cell relationships when you move rows or columns, and distinguish between absolute and relative cell references. Each package has major flaws, but if you don't need to have the best or just want to learn how a spreadsheet could help your business, one of these packages might do the job for you.



Photograph: Dennis K. Schen

MY CALC

Excellent Performance at a Truly Low Price

My Calc from The Software Toolworks is my favorite of the four spreadsheets reviewed here. In terms of price and performance, it's the hands-down winner, and in some ways it feels more like 1-2-3 than the other, more costly contenders.

My Calc lets you enter cell addresses by "pointing," or moving the cursor to a cell, which is often easier than typing cell coordinates. You can use the arrow keys to simultaneously enter cell contents and move to other cells. *My Calc* recalculates cells in logical order rather than by column or row, so you needn't worry about where you locate calculations; you can put sums at the beginnings of rows and columns. The program doesn't have a large number of functions, but it has some good ones: minimum, maximum, table lookup, if, or, average, and net present value.

To make it even more attractive, *My Calc* has several features not found in 1-2-3, *SuperCalc*, or any of the other well-known and more expensive spreadsheets. A particularly useful feature is deletion recovery: If you wipe out a column or row by

mistake, you can call it back. Also, *My Calc* lets you set column widths to zero, thereby hiding their contents completely. With this feature, you can temporarily shrink a worksheet onto the screen or file away hidden notes that explain how you arrived at certain cell values.

Unfortunately, *My Calc* is not without drawbacks. Its miserable little manual has a lot of ground to cover but does so poorly. At \$19.95, *My Calc* would be a good spreadsheet for a novice, but the sketchy documentation makes it a tough program to learn. There's a lot of information in the manual's 34 pages, but a beginner needs more help than that.

Also, the program doesn't always perform as advertised. According to the manual, the PC's function keys are supposed to do useful things, but all they actually do is produce a beep and an error message. A

Software Toolworks representative says this bug will be fixed in a new version soon to be released. The manual also claims that the program includes a pretty-good line editor for modifying cell entries, but I couldn't figure out how to make it work. According to the company, the reference to a line editor was a mistake.

My Calc has a "titles" feature that lets you freeze certain columns or rows onto the screen while the rest of the spreadsheet scrolls by. While this feature may sound useful, don't use it. After you use it for a little while, the spreadsheet breaks up into an aurora borealis of flashing lights. This bug is spectacular but fairly harmless: If you undo the titles, you get your spreadsheet back. This bug will also be fixed in the next version.

With a little debugging and better documentation, *My Calc* would be a solid little spreadsheet. Wait for Version 1.1.

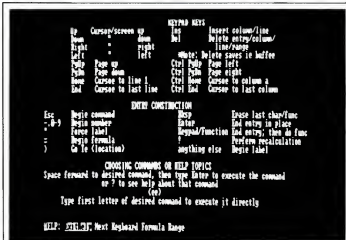


NUMBER WORKS

Poor Design Hurts a Powerful Program

Number Works from Paperback Software could have been a good program, but it suffers from several astonishingly bad design choices. For example, unlike sensible spreadsheets that number their rows and letter their columns, this program numbers both columns and rows. To enter a cell address, you must type R2C2 (for row 2, column 2), for example, rather than B2. That's twice as many keystrokes and twice as much work.

Another problem is that *Number Works* has gone out of its way to limit spreadsheet size by disk space rather than memory. When you first build a spreadsheet, you have to tell the program how many rows and columns it's going to have. *Number Works* then blocks out enough disk space to contain the most complex, densely packed spreadsheet of that size. Thus, if you tell *Number Works* you think you might need 200 rows and 30 columns, it will grind out a disk file of 357,376 bytes. The spreadsheet has nothing in it yet, but it still takes up a whole disk! Of course, you can pack it with numbers, and the size of the file won't change.



My Calc's information-packed help screens may be cluttered, but they compensate somewhat for the program's skimpy documentation.

Row: 1 Column: 1 Help is F1 (F7)M1 (20x10) Mf

	1	2	3	4	5	6	7
	Financial Analysis Envelope Stuffing Business						
Item	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Total		
Envelopes	37.50	45.00	52.50	87.00	222.00		
Postage	112.50	135.00	157.50	261.00	666.00		
Part Time Help	75.00	100.00	100.00	100.00	375.00		
Typewriter Rental	45.00		45.00		90.00		
License Fee		50.00			50.00		
Total	270.00	330.00	355.00	448.00	1,403.00		
					1,403.00		
					(Total)		

This typical screen format for *Number Works* illustrates its cumbersome cell-numbering system that creates more work for the user.

As a test, I told *Number Works* I was going to need 652 lines by 15 columns (the size of the biggest 1-2-3 spreadsheet I ever built). It wrote a hard disk file of 578,560 bytes just to get started, whereas the 1-2-3 spreadsheet I used as a model took up only 200,320 bytes on a floppy. *Number Works* lets you expand a worksheet if you need more space, but it's a cumbersome process involving many menus, two disks, and all kinds of fooling around.

In return for this irritating inconvenience, you do get some protection. The program will write your work to disk as you go along, so a power failure won't do much damage to your current project. Also, if you have the unusual combination of only 128K bytes of RAM and a hard disk, you can build huge spreadsheets that don't have to fit into RAM.

Number Works requires a lot of key-

strokes. It takes 13 to copy four cells from one part of the screen to another, and 4 (a record for this group of programs) just to blank one cell. Formulas can be no more than 42 characters long (they can be 240 characters long in 1-2-3). But once you've entered everything the way *Number Works* wants it, the program works fine. It's fast and powerful, with many useful functions. The ingredients of a good spreadsheet are there; they're just put together badly.

MULTIPLAN

A Low-Cost Luxury Program

Of the budget spreadsheets reviewed here, Microsoft's *Multiplan* is the only one with a reputation and a following. Mail-order houses even carry it. It's the most powerful of the five, with more operators, cell formats, and built-in functions than any of the other budget spreadsheets. It has good cursor control, reasonably quick screen refresh, and an adequate line editor for cell entries. It uses named ranges and logical rather than row- or column-order calculation.

Multiplan also has a good system of "linking" spreadsheets. As long as you keep them on the same disk, you can make

the values of a "dependent" spreadsheet automatically reflect changes in "supporting" spreadsheets. The program lets you undertake complex work with only 64K bytes of RAM as long as you keep subordinate calculations in small, separate spreadsheets.

Multiplan lets you change background, foreground, and border colors; you can even have different colors in different screen windows, an arrangement that looks very snappy on a color monitor. The program also has a good file utility that quickly lists a disk directory when you want to load a file. You can then type in the name of the file or move the cursor to it and hit Enter. Another handy utility allows you to sort spreadsheet rows either alphabeti-



When most business software costs as much as a color monitor, it's a treat to find a spreadsheet that's priced no higher than a hardcover book. My *Calc* doesn't have the power of programs 20 times as expensive, but it feels as much like 1-2-3 as any of the budget spreadsheets we tested and stacks up against them remarkably well in a point-by-point comparison. If My *Calc* cost \$99.00, we'd vote for *Multiplan*, but at \$19.95, it's the pick of the litter.

cally or numerically.

Multiplan's iterative function is useful for setting up deliberately circular calculations that converge to a solution. You can use this feature to solve polynomial equations, but the explanation in the manual is sketchy. Finally, another nice touch lets you silence your computer's speaker. Otherwise, the machine will squawk at you whenever you do anything wrong.

Despite its power and numerous features, *Multiplan* still has some surprising

PC FACT FILE



Number Works
Paperback Software Int'l
2612 Eighth Street
Berkeley, CA 94710
(415) 644-2116
List Price: \$39.95
Requires: 128K RAM, one disk drive, DOS 2.0 or later.

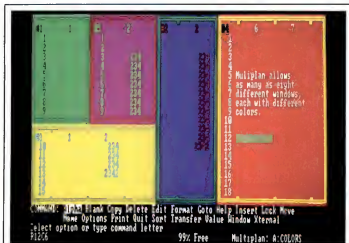
CIRCLE 691 ON READER SERVICE CARD

PC FACT FILE



Multiplan
Microsoft Corp.
10700 Northup Way
Bellevue, WA 98004
(800) 426-9400
List Price: \$195
Requires: 128K RAM, one disk drive, DOS 1.1 or later.

CIRCLE 690 ON READER SERVICE CARD



Multiplan's sophisticated windowing capabilities allow you to view disparate parts of the spreadsheet together.

flaws and rough edges. First of all, it uses the same silly labeling system as *Number Works*: It numbers both columns and rows. Sometimes, however, you can abbreviate range addresses: R1C1:10 means all cells from row 1, column 1, to row 1, column 10. Still, it's a second-rate cell address system.

The manual is also second-rate. Although it rambles on for more than 400 pages, it assumes that you have a good deal of computer knowledge, and it is often unclear. The explanations of *Multiplan*'s functions are especially poor. Also, although the program comes with a handy reference pamphlet, it tells you nothing specific about the IBM keyboard.

Though it does not have macros or graphics, *Multiplan* is a solid spreadsheet that will meet most needs. It's surely the most powerful spreadsheet that can run in only 64K bytes of memory.

MAGIC WORKSHEET

Easy to Use . . . and Crash

Magic Worksheet boasts it is "the easiest to use electronic worksheet available." It

may be true. The claim is based on two features: an on-line tutorial and elaborate prompt messages you can turn on or off. The disk-based tutorial, which isn't inter-

Magic Worksheet's prompt messages are miniature help screens that come up automatically whenever you need to make a menu choice.

active, is nothing to shout about. The series of screens are no different from a book.

The prompt messages are another matter. In effect, they are miniature help screens that come up automatically whenever you need to make a menu choice. As soon as you finish a command, they go away. These messages are a big help if you've never used a spreadsheet, and you can turn them off once you've learned the basics. After that, you can call up conventional help screens if you need them.

Magic Worksheet's manual is very clear. Every command and function is well explained. The program also has a feature I have never seen anywhere else. In addition to the usual replication and move routines, *Magic Worksheet* also makes genuine copies. You can make an exact copy of a range of cells and leave the original as it was. It's like a 1-2-3 Move command, except that the original range stays in its original position.

The program has a fatal flaw, however: It locks up a lot. You don't have to do anything tricky; it seems to stop working whenever it wants. A warm boot will get you back to DOS, but all your data is gone.

Even if *Magic Worksheet* ran perfectly, it wouldn't be my favorite budget spreadsheet. It was written for the CP/M operating system, and it ignores function keys and other PC-specific keys like Home and PgUp. What's more, it's slow. It came in last in *PC Magazine*'s time trial. The screen is also balky. You can outrun the cursor when you're changing rows or columns, and the program moves slowly from one screenful of data to another.

All other spreadsheets I've seen indicate the cell at which the cursor is located by displaying its contents in reverse video, making that cell stand out clearly. *Magic Worksheet* displays the contents of the current cell in high intensity, which isn't nearly as effective.

Finally, all the other programs tested here let you copy formulas so that some of their cell references are relative and some absolute. *Magic Worksheet* doesn't give you a choice. All cell references have to be either absolute or relative.

This program is certainly easy to learn, but once I had learned it, I'd never use it. ■

Jared Taylor is a contributing editor of *PC Magazine*.

PC FACT FILE



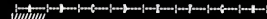
Magic Worksheet
Structured Systems Group
111 Broadway, Suite 203
Oakland, CA 94607
(415) 268-1488
List Price: \$49.95
Required: 56K RAM,
two disk drives

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Budget Spreadsheet Lineup

	My Calc	Number Works	Multipian	Magic Worksheet
Price	\$19.95	\$39.95	\$195	\$49.95
Workspace	255 rows/ 52 columns	see text	255 rows/ 63 columns	255 rows/ 64 columns
Adjustable column width	yes	no	yes	yes
Number of split screens	0	8 (claimed)	8	2
Number of logical and arithmetic operators	11	5	11	5
Number of functions	16	32	42	22
Copy protected	no	yes	no	no
Sends control codes to printer	yes	no	yes	no
Time trial (in seconds (Find $\sqrt{3}$ 168 times and display to 5 decimals)	25	16	16	83

EDIT: Press RETURN for active cell or enter desired cell location



EDIT: Change contents of cell (so you need NOT re-type entire entry). Press RETURN to EDIT active cell OR enter location of cell to EDIT.

When you select EDIT, the entry appears on the command line.

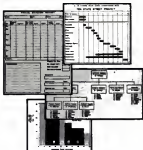
The ARROW (or CONTROL) keys temporarily perform different functions:

- LEFT (or CTRL-D): moves left one character
- RIGHT (or CTRL-D): moves right one character
- UP (or CTRL-E): inserts a space for one character
- DOWN (or CTRL-D): deletes (removes) one character

Type your correction and press RETURN.

Magic Worksheet's automatic help messages can be set to appear whenever you make a menu choice. These are different from the program's full-screen help messages.

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In the dark ages before the personal computer was even a dream, I first encountered the data processing equipment made by Wang Laboratories. Half a dozen electronic calculator workstations made by that company lit the science lab at my college with the bright-orange glow of their Nixie numbers-only readout tubes.

Since then, Wang has become a name to be reckoned with. It has evolved from manufacturing primeval lab equipment

The Wang Professional reflects its maker's roots in word processing: It's a writer's machine from head to toe.

A PROFESSIONAL MICRO FROM WANG

to assuming a leading role in making word processing equipment. With the personal computer wrestling the office automation market from the dedicated word processor, however, the fortunes of Wang seem to have turned as dismal as my job prospects were upon graduating with a liberal-arts education.

The migration from dedicated machines to programmable computers is motivated by a desire for versatility—a word processor does nothing but process words, while a personal computer can do that and more, automating almost any function required in a small business or office. Other manufacturers have greedily tried to cash in on IBM's success in the small-computer field by making personal computers that differed from IBM's products in only one respect—the PC-like machines tended to drive their makers into debt.

With its Professional Computer, Wang joins their ranks. Officially, the company promotes the Professional as a better PC, a high-performance personal computer endowed with a true 16-bit 8086 microprocessor running at a clock speed of 8



MHz (compared with the IBM PC's sedate 4.77 MHz) and featuring an optional 8087 math coprocessor. Those specifications and claims alone are hardly sufficient to distinguish it from the horde of PC clones crowding the marketplace. My time trials, using Peter Norton's Sysinfo speed test, put it in league with the AT&T 6300 and the Compaq Deskpro, neither of which is a runaway sales success, with a rating of 1.9 (the standard IBM PC is 1.0).

The real strength of the Professional is somewhat more profound. It's a truly different sort of personal computer that combines the programmable versatility of an ordinary desktop personal computer with Wang's famed and powerful word processing system. The result is a computer that promises not only a good level of compatibility with the IBM PC but more computing speed and power.

At press time, Wang released its new Advanced Professional Computer, based on the 80286 like the AT but with a faster version of the microprocessor—8 MHz versus the AT's 6 MHz. Wang claims it is compatible with software for the PC, XT, and AT. This fall, Wang will release a version of its word processing software that runs on IBM PCs and compatibles. This package's \$695 price includes a Wang-style replacement keyboard.

The Incredible Hulk

Physically, the Wang Professional is a hulking brute that makes the IBM PC look almost dainty. It's longer (almost 2 feet long), higher (more than 8 inches high), and nearly as wide. It's big enough, in fact, to overwhelm most desks. Wisely, Wang's ads never show the unit atop a desk in the illustrations nor in the accompanying manuals—it's either hanging

from the side of a worktable or totally out of sight.

Slide the Professional's cocoonlike steel case forward and off, and you'll see hardware that looks more like it belongs in a minicomputer than in a micro. At the front of the welded-rod chassis, two full-height disk drives peer through the cast metal front-panel bezel. As with the IBM



Up front, two full-height disk drives peer through the metal bezel.

PC, various combinations of drives can be fitted into the slots. The minimum factory configuration is one double-sided, double-density floppy disk drive (maximum capacity, 360K bytes). A second floppy or a hard disk of 10 or 30 megabytes is optional. In the machine reviewed, the right slot was filled with a Micro Peripherals floppy and the left slot featured a Seagate ST-412 10-megabyte hard disk.

The area behind the disk drives is given over to several large (8 inch by 12 inch) expansion boards of proprietary shape and design that slide in horizontally. The Wang expansion cards are completely incompatible with all the standard PC-compatible expansion cards on the market. Wang offers two different system units, one accommodating five expansion cards and the other eight.

The L-shaped system board underlies most of the chassis. The system board and

all expansion boards plug into a motherboard (which holds no active circuitry; it carries only the bus and connectors) on the left side of the large, steel-cased power supply (no power rating is visible), which runs nearly the entire length of the left side of the chassis.

Once you install any option cards, your access to the chips on the system board is virtually cut off, but that hardly matters because only the microprocessor and a few other big chips are socketed. The 128K-bytes of parity-checked RAM on the system board is soldered in place and completely hidden under the disk drives.

The Professional can be expanded up to a total system memory of 768K bytes of RAM using expansion cards with up to 512K bytes on a single card. The test machine had 128K bytes of additional memory on one partly full expansion card. All memory uses 200-nanosecond, 64K-bit chips.

The floppy disk controller circuitry as well as a communications port and a printer port are contained on the system board. The evaluation machine used one expansion slot for a hard disk controller and two others for display adapters.

The review system was equipped with a particularly unsatisfying color monitor. It's smaller than the standard IBM Color Display, 12 rather than 14 inches diagonally, although it has a finer dot-pitch and resolution rating. Like the IBM display, the screen matrix is pleasantly dark and unpleasantly shiny, lacking any antiglare treatment. My real disappointment was not with the monitor itself (although I did find the barrel distortion of its image distracting because of the pronounced curve it gave to the straight borders of the screen) but with the software that controls it. Displayed characters all looked suitably sharp in a very readable sans-serif typeface, except for the troublesome and often confusing lower case *m*, which proved to be even more ambiguous on the Wang than on other monitors.

The monitor is capable of displaying a full rainbow of colors, and you can change them easily through the menu system. An optional IBM PC color-compatibility expansion card and special compatibility software endow the Professional with the ability to run PC-DOS and display all 16



PC-S2-2 Professional
Wang Laboratories Inc.
One Industrial Ave.
Lowell, MA 01851
(617) 459-5000

List Price: \$3,300 for 256K RAM, two disk drives, monochrome monitor, IBM emulation board, Wang word processing software, and MS-DOS.

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standard PC colors. While the compatibility adapter does fulfill its designed purpose (for the most part), it represents unprecedented engineering overkill. Many hardware designers have complained about the high chip count—the large number of integrated circuits—IBM uses on its color/graphics display adapter, but here Wang has Big Blue beat. The low-resolution (640 by 225) Wang color board uses over 100 integrated circuits. Add in the IBM-compatibility card and you double that number—all for ho-hum text and graphics abilities.

A Key Difference

Wang's dedicated word processor keyboard is probably the company's second-greatest claim to fame, eclipsed only by the software the keyboard controls. Almost as universally praised as the IBM PC's is damned, Wang's word processor keyboard couples a replica of the IBM Selectric typewriter alphanumeric key layout with a light touch and a liberal dose of dedicated function keys.

The Wang Professional's keyboard is a half-breed, however. It retains many of the characteristics of its word processor forebears but alters the styling in favor of the now-traditional PC clones. The standard alphanumeric keys are arranged in QWERTY fashion, exactly as they are arrayed on the typical office Selectric typewriter, with a large Return key at the right edge and a Shift at the left with no odd intervening keys.

Compared with the Wang word processor's keyboard, the Professional's keyboard is longer (owing to the addition of a numeric keypad), thinner, and lighter in color (white keys instead of gray), probably to more closely approximate the German DIN standard. Compared with the IBM PC's keyboard, it's slightly thicker and not as adjustable, with a permanent forward-leaning cant of approximately 10 degrees. Although the principal key layout is still pure Selectric, with only the Tab key reduced in size to make room for Esc, the keytops themselves resemble those of the PC more than the Wang word processor or Selectric in that even large keys, like the Return key, have 1/2-inch rather than full-size touch areas.

Beyond the alphanumeric realm, the Wang key endowment differs even more

from IBM practice. To the right of the typewriter keypad is a dedicated cursor pad and further to the right is a numeric keypad. Across the top is a long row of function keys, totaling 17. Other dedicated function keys complete the cursor pad, including the Insert, Delete, and Execute keys.

In the Wang world, the Execute key takes the place of Enter to confirm to the

The Wang user interface
will probably be a
pleasure for computing
neophytes, especially
when compared with PC-
DOS's silent A> prompt.

computer that you have finished typing a command and you really mean what you say. The Return key is reserved for ending paragraphs and moving on to the next line. Complementing Execute is a Cancel key in the upper right-hand corner.

The left-hand Shift Lock key has an LED that confirms its locked state. No indicator is required for the NumLock key—the separate cursor and numeric keypads make that key unnecessary.

The feel of the keyboard is very light but positive. A key press gives no discernible tactile or audible feedback of its own; the small loudspeaker in the Wang keyboard vociferously clicks with every key press, but Wang has created programs that let you adjust the sound. I found the absence of tactile feedback no handicap and was able to type at least as quickly as on my IBM PC.

Collecting Shells

The Wang user interface will probably be a pleasure for timorous computing neophytes, particularly when compared with PC-DOS's silent A> prompt. The Wang system is an enhancement to the MS-DOS that runs the machine, functioning as a complete menu-driven shell or "front-end." The monitor displays a list of all the functions available to you, and you need only select the one that pleases you most and press a special key to bring it to life.

You won't be confused by a plethora of

options because the menus are essentially minimalist—you get very few functions from which to choose. In fact, a whole screen may only have four or five available selections.

At times the sparse screen can be bothersome. For instance, Wang chose not to clutter the screen with disk directories even at times when the menu asks you to select a file from those on the current disk. Should you attempt word processing and forget the name of a file you have been slicing up, you have to back up one menu and issue a separate directory command to see a disk directory. Then you must remember the file name, back up one menu again, and type in the file name.

You pick (but do not activate) the function you want by nudging the space bar to advance an indicator bullet and a section of highlighted lettering downward through the listing. It's a one-way trip—you can't back up, although the selection loops around from the end back to the beginning. Because of the Professional's audible feedback clicker, when you scroll through a lengthy list of selections it's like listening to a woodpecker.

Once you've highlighted your chosen function, press the Execute key (which, remember, is separate and distinct from Return), and the Professional grinds into action. Should you make a mistake after pressing Execute, you can easily back up through the menu system by pressing the Cancel key.

Compared with command-oriented PC-DOS, the menus might seem clunky and slow, but if you're not technically inclined and have no desire to become so just for the sake of pleasing a machine, you'll probably love the Wang's pick-and-choose system.

The Wang proprietary software is certainly simple to operate, but PC-DOS still has the edge in ease of use, particularly in the detail department. For instance, the Wang shell has no equivalent of PC-DOS's batch files. You must do every repetitive task yourself or exit the shell. You can run normal batch files from the Wang shell, but you cannot automate functions in the shell itself. There's no AUTOEXEC.BAT file, so you must always start from the very beginning. Wang engineers even made entering the correct date and time

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8:00 am. You get to work on time, despite the 44 mph turkey ahead of you in the fast lane. It's spread-sheet time. You hit one key. Lots 1-2-3 (or whatever) is up and running. (One key because SuperKey has recorded all the **CD<123> <ENTER> >123< ENTER> <ENTER> / F <ENTER> R <ENTER> SALES <ENTER> <PgDn>** footloose and your one keystroke played all that back instantly. One keystroke instead of a rouser).

8:03 am. You're into the spreadsheet. Phone rings. You lick in SideKick's Notepad—without leaving your spreadsheet. You talk. You listen to Frank. You make notes that tell you that Frank is upping the numbers from yesterday's order and he needs a new price and delivery date. He wants a meeting. Fast, but when? You have SideKick fire up your Calendar. Time agreed and noted—in SideKick's Notepad. Conversation ends. Your spreadsheet is still there.

8:07 am. You're watching the spreadsheet but you're thinking about the new bid you have to figure out. So you have SideKick's Calculator pulled up on the screen—over a small piece of the spreadsheet—which doesn't go away.

8:08 am. SideKick is coming up with new numbers. SuperKey keeps the spreadsheet on a roll. Satisfied with the numbers, you have SideKick auto-dial Frank's number. Talk. Talk. Hang up.

8:09 am. Spreadsheet about done. You're watching it, but thinking about what Frank just said on the phone. He liked your numbers. He ordered. He said, "That was fast. We won't need that meeting." (SideKick cancels it from your Calendar). And he also said, "How did you get all that done so quickly?" And you said, "I've got a couple of new guys working for me."

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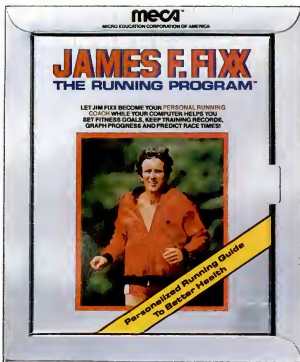


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CIRCLE 150 ON READER SERVICE CARD

STEALING BIG BLUE'S THUNDER

Wang would like to be perceived as a company with a lot of class and a lot of firepower. But amid slumping sales and missed shipping dates, does Wang have the ammo to make an assault on IBM?

Corporate headquarters. A top honcho swats at pesky insects that swarm around his head. Outside a battalion of helicopters clatter to the ground. Executive paratroopers zero in on enemy territory.

The conquering hero in this video scenario—created by Madison Avenue, not the Pentagon—is Wang Laboratories. The enemy is IBM, swatting at its smaller competitors. The message is that Wang is the only company powerful enough to steal Big Blue's thunder in office automation.

But the helicopters face a tough battle. For the first time in its 34-year history, Wang, number 227 among the Fortune 500, has posted a loss. In 1984 the company earned a record \$210.2 million on revenues of \$2.2 billion, and its sales have doubled since 1982. Third-quarter earnings for 1985 plunged, however. Two months before posting its fourth-quarter earnings, Wang, from its headquarters in Lowell, Massachusetts, predicted a loss for the quarter but profits for the year overall.

An Wang, the company's 64-year-old China-born and Harvard-educated founder and chairman, laid the blame on "lower-than-expected levels of business" and "slower-than-anticipated savings" from cost reductions. The company, which is known for its Japanese-style benevolence toward its workers, also announced the dismissal of 1,600 of its 32,000 employees, in all areas except research and development and customer support.

Time will soon tell whether Wang's problems are a barometer of the current industrywide malaise or a reflection of a serious corporate ailment.

Wang's four major competitors for office automation sales—IBM, Hewlett-Packard, Data General, and Digital Equipment Corp.—also reported drops in quarterly earnings. William C. Kanupke, vice president of Dataquest, a market research firm with headquarters in San Jose, California, sees Wang's problems as a reflection of the state of the industry but also notes that Wang also has its own problems, particularly concerning delays in shipping new products.

Patricia B. Seybold, who heads a Boston-based office automation consultant group, says that Wang is meeting the challenge of its recent financial setback head on. "The bad news," Seybold says, "is that Wang still has another tough 9 months ahead in terms of its order rate, acceptance of product, and service and support problems. The good news, however, is that Wang's management is making every effort to get its arms around the problems and address them." One way Wang is tackling its problems is with small, effective teams of troubleshooters. Seybold describes them as "heavily empowered, active, cross-disciplinary task forces," who, she says, should be able to effect results that the customer will be seeing in about 6 to 9 months.

A New Strategy

Wang is banking on its new hardware and software, which the company admits it shipped late, to penetrate IBM's fortresses: the MIS departments of the country's top companies. Wang's longtime customers have been department heads who have purchased word processors, computer links, document filers, and other office automation tools for their

units. But the managers of the corporate-wide MIS departments, who have bought IBM mainframes for years, tend to consider Wang an upstart from the steno pool.

Realizing that the corporate world relied more on personal computers and that the famous Wang dedicated word processors would eventually be outperformed by more advanced, multipurpose machines, Wang set out about 5 years ago to do hand-to-hand battle with its major competitors in the office arena, especially IBM. The weapons would be state-of-the-art systems featuring the Wang Professional Computer, *Wang Office*, the software that connects Wang Professional Computers and VSS (mini-based virtual storage systems) and integrates interoffice communications, electronic mail, file management, calendaring, and directories; and Wang Systems Networking, which includes the WangNet local area network.

In early 1983, John F. Cunningham, who took over from An Wang as president the same year and who was also CEO until he resigned both positions on July 19, 1985, announced new versions of the Wang Professional Computer and slashed prices. His strategy was clearly to offer advanced products at competitive prices, to help establish industry standards, and to accommodate the mixture of other vendors' equipment. The move also affirmed Wang's determination to remain a major force in office automation while acknowledging intense competition.

When *Wang Office* was announced, Cunningham said his company was not only reinforcing its "leading-edge systems networking approach but also pro-

viding users with a higher degree of compatibility, versatility, and price." At the same time, he announced Wang's family of software products as part of Wang Systems Networking: "The significance of this development lies in the fact that . . . a number of Fortune 500 companies . . . have a substantial investment in an IBM network and Wang office automation products. . . . These companies can now integrate their systems in a single communications network."

Cunningham's recent departure to become chairman and chief executive of Computer Consoles, Inc., of Rochester was another blow to Wang's uncertain position in the marketplace. His leadership, especially in marketing, will be hard to replace. Robert T. Fertig, a Stamford, Connecticut, computer industry consultant, compared Wang's situation to that of an "airplane losing altitude that suddenly loses an engine as well."

A Swing to IBM

Wang seemed to be adroitly following the orders of industry analysts. So what went wrong? Some might say that Wang simply took the hard knocks of the industry-wide slump and the strong dollar abroad. Others, like Stephen K. Smith of Paine Webber, see the problem less in terms of overall market trends than in terms of one competitor—mighty IBM. A Paine Webber survey of 25 of Wang's biggest customers showed a swing toward IBM in major accounts. As one Wang sales rep said after winning a \$5 million sale on Wall Street, "IBM is starting to bring out the big guns." Experts conjecture that the best position Wang may be able to hope for is a strong second place behind IBM.

The battle for sales can be fought on more than one front, however. As Cunningham noted, many of Wang's customers have a large investment in IBM PCs. Technical snafus apparently have delayed delivery of a Wang "PC connection," which will tie IBM PCs into Wang networks, but Wang is expected to reannounce its commitment to this offering soon. Customer interest in the PC con-

nection is strong according to Patricia Seybold, who maintains that one of Wang's best strategies would be to offer a version of the complete *Wang Office* software that would run on the IBM PC. With so many IBM PCs in place in offices throughout the country, sales would soar and the impression that Wang means only word processing would fade. Infiltration of enemy territory would give Wang a chance to prove its products' mettle.

The all-guns-to-the-fore thrust of the Blue Thunder commercial is in sharp contrast to another Wang video image and its soft-edged portrayal of the "paratrooper's alter ego, an opera singer in white tie and tails. In this Wang commercial the singer prepares in the wings and then goes onstage amid applause to make sweet music in unison with his fellow Beethoven vocalizers. The indirect message sings the praises of the Wang systems' civilized integration and artful performance, characterizing the company and its products as not only high tech but also high class.

On the one hand, Wang's image makers seem to be saying Wang is the vendor of elegantly designed, easy-to-use products that make office workers in the ranks sing rather than cry out in frustration. But with its helicopters, Wang sang another tune. The battle cry has been raised. No longer content to stay in the secretaries' ranks, Wang wants to win the executives away from IBM with the Wang Professional Computer, *Wang Office*, and *WangNet*. But the key to winning the profits war may be a matter of strategy rather than a matter of equipment. Wang could win an industry victory, posit tacticians like Seybold, if instead of training all its guns on the target of replacing IBM PCs with Wang Professionals it would deliver on its PC connection, enabling its customers to hook their IBM PCs into Wang networks and use the complete *Wang Office* software family.

—Carol Olsen Day

Carol Olsen Day is a New York-based writer and consultant.

more bothersome—leading zeros suddenly assume great importance.

The version of MS-DOS that Wang supplies also has a couple of major shortcomings. The *FORMAT* program will not automatically transfer the operating system to new disks with the /S option. Moreover, the *SYS.COM* program was not supplied with the Wang version of DOS. In other words, Wang provides no facility to make bootable disks. Additionally, if you want to explore or alter files, you won't have *DEBUG* to help you.

Warm boots are also a pain. When the system locks up, pressing the Wang's four-key equivalent of Ctrl-Alt-Del rarely does anything to unlock it. Moreover, when the system does properly perform a warm boot, there is often a 5- to 10-second delay between the time you press the required keys and the time the disk drive finally springs to life. I quickly learned to reach for the On/Off switch instead.

An additional problem I encountered was sorting through the documentation. While the Wang manuals are quite clearly written, they come in abundance—a hierarchy of more than half a dozen, graded by difficulty. I never seemed to be able to pin down the information I was after, even for simple matters such as identifying the ports on the back of the machine.

Wang Goes IBM

Wang offers a reasonable variety of software tailored to the Professional, including several programming languages (primarily Microsoft dialects)—Pascal, FORTRAN, COBOL, and a BASIC compiler. Several emulation options are available, including 3276 SNA/SDLC, 3276/3275 BSC, and even DEC VT-100. Besides word processing, Wang also offers its own versions of *Multiplex*, a simplified database, a more powerful database, and a business graphics program.

Straight from the box and running Wang's own version of MS-DOS, the Professional's PC-compatibility is near negligible. About the best that can be said is that the Wang will run the same disks as a PC clone and that its data files can be interchanged with other systems running MS-DOS and 5 1/4-inch disks.

Try running standard PC-DOS or nearly any application written for the PC that

digs deeper than DOS to get into the PC's ROM BIOS entry points, and you're sure to face a calamity. Even programs that have previously proven to be the most compatible with other clones crashed with a string of error messages about an invalid interrupt. My base measure of compatibility is *WordStar*, but on an unmodified Professional, even it rates a big *no way*.

After adding special hardware—the Wang/IBM Monochrome Emulation Monitor Card (\$595) or the IBM PC Color Emulation Card (\$575)—and running an IBM PC-compatibility program, which reroutes all the otherwise-invalid interrupts and juggles around the information headed for the video display, the Wang gains a reasonable degree of PC-compatibility.

Wang claims the Professional will even run such ornery programs as *Flight Simulator*. In my tests, however, the Professional's compatibility proved far from complete. Although it does run most IBM PC programs without modification, I found quite a few bugs. It runs Compaq BASIC and compiled IBM BASIC programs without a hitch. (Standard IBM BASICA will not run because the ROM-resident portion of the program is unavailable in the Wang.) Most assembly language-level programs run properly. However, Core International's disk performance test program promptly crashed (see "Core's Hard Disks: Workhorses of Performance Computing," *PC Magazine*, Volume 4 Number 16). When I tried running the old-standby *WordStar*, everything worked as it should until I tried to exit back to the operating system, at which point the Wang stalled and had to be rebooted.

Evidently the Wang display adapter transmits text information to the IBM-compatibility card as if the IBM card were a fast teletype (rather than reading screen pixels in memory-mapped fashion). To clear the screen, instead of just blanking memory, the Wang scrolls all the text up and off the monitor tube. Although these scrolls are fast enough to nearly mimic direct writing to screen memory, the Wang had a bothersome propensity for leaving the last line floating unattached at the top of the screen.

Graphics programs displayed properly for the most part. However, text in mixed-

screen mode was garbled when I ran IBM Logo, and a few other idiosyncrasies preclude the award of true PC-compatibility to the Wang. In other words, the Wang is another one of those computers that runs many programs, but nothing is guaranteed. Essentially, you must take your chances and pray your favorite program will run.

That level of compatibility may be

Instead of being integrated into the system, the Wang PC's IBM PC compatibility is a patchy add-on.

good enough for most purposes. However, the Professional's PC-compatibility still rates low on my list. The whole point of putting up with the astonishing physical bulk of the Wang is for the ease of use given by its proprietary software, and just getting PC-DOS to run subverts that purpose completely.

Instead of being integrated into the system, the compatibility is a patchy add-on. First you have to buy expensive hardware. Once that is installed, you have to put up with daily tedium. You must exit the Wang shell to get to MS-DOS, then call up the compatibility program. Finally you must boot up with your own copy of PC-DOS, which Wang does not supply. This process cannot be automated with a batch file. Moreover, if you have both Wang and PC applications, you have to shuffle disks each time you switch between them.

Mincing Words

The crowning glory of the Professional is, without a doubt, Wang's word processing software. While some programs claim to be patterned after it and others claim to have been developed by the same people, Wang has the real thing—identical to what you'd get on a dedicated Wang word processor.

Wang's word processing software is delightfully simple to use, yet it will do just about everything you normally need to do to text. Instead of needing to memorize all sorts of arcane commands, you work your way through your documents using a mix-

ture of menus and function keys.

The user interface has exactly the same structure as the Wang operating system shell. Obviously, the company knew it had a good thing with its dedicated word processor and simply extended those capabilities to encompass the operation of the whole machine.

Developers of other word processing programs must rely on menus to facilitate the operation of their programs. Wang had control of both the software and hardware, and its developers were therefore able to design into them all the dedicated function keys they needed. Each of the common word processor commands—INSERT, DELETE, MOVE, FIND, REPLACE—has its own function keys using the 17 in the top row and various others elsewhere on the keyboard. (Alas, Wang does not completely free you from control-key combinations, but those that it requires seem logical enough.)

All functions controlled by these dedicated keys conform to a "start, mark, and execute" structure. For instance, if you press the Delete key, the program marks your place and asks you what you want to delete. Using the cursor keys, you can mark as much text as you want. Finally, when you've marked everything that you want to blast away, you press Execute and the words disappear.

Conclusion

Access to the admittedly excellent Wang word processor might be reason enough for you to consider buying the Professional. In fact, that's one of the best reasons for making the big purchase. Other PC clones are as powerful—or even more powerful—and many of them are more PC compatible or at least friendlier about being compatible.

However, the Wang Professional has another degree of compatibility no other PC clone can claim—it's a full-fledged member of the Wang line of office automation equipment. If you already own other Wang hardware or if you're considering adding a dedicated word processor to your workplace, the Professional is a logical choice. ■

Winn L. Rosch is a contributing editor of *PC Magazine*.



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Footprint, you say?

Look under the printer, Watson. The paper tracks from that lower tray, feeds up through the bottom or rear of the printer, and refolds back underneath, into the upper tray.

Tracks? Footprints? Holmes, I'm baffled.

Very observant, Watson. These cunningly designed baffles are the secret of its precise, smooth operation.

A smooth operator?

Even with its back to the wall, Watson!

Are we tracking the footprints of a smooth operator? Holmes, I haven't a clue...

It's no secret, Watson—all other printer stands are now obsolete. Meet the MicroFold!

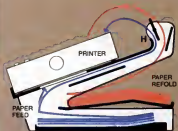
MicroComputer
Accessories, Inc.



Model #930
80 column printer stand



Model #940
132 column printer stand



Wang's local area network for its PCs, like much of the rest of its personal computer line, may best be described as unspectacular. Far from a criticism, the term *unspectacular* may be one of the highest compliments you can pay a local area network: Wang's network is so transparent that average users may not even be aware that they are

The LJO network hardware consists of a single LJO card, which is placed in the electronics unit (the Wang term for the system unit) of each network node. However, networks of more than two nodes also require an LJO repeater, a passive box that serves as both a receptacle for multiple connections and a signal booster, which is similar to those used by cable television.

PC NETWORKING WANG-STYLE

Although it isn't IBM PC compatible, Wang's easy-to-use, easy-to-install, and unobtrusive local area network is a good example of the company's fine craftsmanship.

working on networked computers.

Networking is an area in which Wang is on more solid ground than IBM. One advantage to working in an office equipped with Wang hardware is that all different types of machines can swap information with only a little of the hassle everyone has come to expect from working with IBM's line. Enough versions of Wang Systems Networking are available to support just about any configuration of Wang equipment.

Wang's method of networking its PCs, called the Local Interconnect Option (LJO), uses a coaxial baseband network at a speed of 2.5 million bits per second. LJO employs a modified token-passing protocol to move data among the nodes of the network. Nodes can be either Wang Professional Computers or Professional Image Computers in any combination up to a total of 255. The network cannot include IBM PCs or compatibles, although there are rumors that Wang has a board that will let you do just that. Unfortunately, it is not currently available.

Each repeater can accommodate between 8 and 24 connections, each up to 2,000 feet apart (see Figure 1 for a sample LJO network). You can connect a repeater to personal computers or to other repeaters to extend the network to a maximum 255 nodes. Repeaters do not count as nodes; they just facilitate the installation of nodes.

Cascading Clusters

The LJO repeaters can act as concentrators, or the centers of clusters, in the network topology. Therefore, an LJO repeater can serve an individual office or an entire floor in a building. The best way to describe the overall network topology is "cascading clusters." This topology allows a largely free configuration of the network, while at the same time allowing for easy installation and some saving because of economies of scale.

Because the LJO repeater rather than the cable itself "taps" into the network (as is the case with Ethernet), the installation of a new node or repeater is unintrusive; that is, it doesn't disturb the nodes that are

already installed. Many network manufacturers claim, whether their products use intrusive tapping or not, that you can install new nodes without affecting the operation of the network; Wang's technique really makes good on this promise. The LIO's installation is simple and doesn't require any special installation kit. You just have to be able to attach a standard coaxial cable BNC connector to both the repeater and the LIO card in the Wang PC.

The software that actually runs the Wang LIO network, called Professional Network Services, attempts to create a consistent and simple interface between the user and the network. The Professional Network Services software operates under MS-DOS and, in a technical sense, works similarly to most other network software. You install a small device driver by means of CONFIG.SYS when you boot MS-DOS on the Wang PC. At some later point, normally in an AUTOEXEC.BAT file, you load the bulk of the network software. This software, which you can load and unload whenever you are not using the network, remains resident and takes up about 128K bytes of RAM.

One interesting point is that the Wang PC can use its menu system in place of the normal COMMAND.COM. You can access the Professional Network Services software via an extensive menu system as well as directly through programs run from the normal MS-DOS command level. In this manner, you are insulated not only from starting up the network on the Wang PC, but also from many of the details involved in using a network.

The Professional Network Services software offers two main services: remote

disk access and printer sharing. Instead of sharing just the host's disk, the stations in a Wang PC network share locally attached disks and printers.

Remote disk access simply lets you use the data stored on another Wang PC's disk as though it were on a disk in your own machine. Seeing your disk light flashing because someone else is accessing your disk can be somewhat disconcerting at first, but the ease and simplicity of this approach to

The software that runs the Wang LIO network, called Professional Network Services, attempts to create a consistent and simple interface between the user and the network.

disk networking makes up for the strange side effects.

The Professional Network Services software makes sure that someone else doesn't begin printing when you're right in the middle of printing something by adding a new layer to DOS, which is in charge of queuing print requests. This method is similar to the way printing is done on mainframes and minicomputers. While it works, printer sharing has its disadvantages; I don't think I'd want the printer on my desk actively servicing everyone in the office all day long.

A New Identity

Once you install the device driver and load the network software into memory, your personal computer is on the network and whatever resources it has been enabled to share are available to the network. Before you can use any of the resources attached to the other networked personal computers, however, you must log onto the network by supplying your identification or user ID and a password. This identification is for the entire network rather than just for a single Wang PC, so you can use it to log onto any PC in the network, not just your own. Your user ID also entitles you to access whatever resources the network's

security mechanisms allow.

Each node in the network has a name, which can be functional and innocuous, such as NODE4F, or more descriptive, such as FRED. The network knows which nodes are currently on the system and running the network software. As soon as a new node—FRED, for example—starts up, that node informs the rest of the nodes on the network where it can be found. Once a number of unsuccessful attempts to access FRED from node NODE4F are made, FRED is considered to have left the network (see Figure 2).

You can access all network disks and files through the logical drive Z:. If all the nodes in Figure 2 were up, a directory of drive Z: would look like this:

```
Directory of Z:/
FRED      <DIR>
NODE4F    <DIR>
BECKY     <DIR>
3 File(s)
```

Each node in the network shows up as a directory on the pseudo-drive Z:. A directory of Z:/FRED would reveal the subdirectories A: and C:, representing the two available disks on node FRED. A user on node BECKY or node NODE4F could access the file CONFIG.SYS on the hard disk C: of node FRED as Z:/FRED/C/CONFIG.SYS.

The LIO network's method of accessing files is very consistent and easy to understand. It also allows any MS-DOS program that knows how to handle pathnames to access files on the network. Filenames can easily get a bit cumbersome; the Professional Network Services software, however, allows you to get around this by letting you assign a path prefix to a single letter. For instance, you can make Y: equal to Z:/FRED/C/STUFF. Then, to reference TEST.C in /STUFF on FRED's disk C:, you can just type Y:TEST.C. The network software intercepts Y:, translates it to Z:/FRED/C/STUFF, and then uses that path to find the file. This feature is actually useful even beyond networking; it allows programs that don't understand pathnames to use files in some subdirectory by just using a single drive letter.

To print a file, you simply queue your print request at a network printer. If you want to print screens from a program, you

PC FACT FILE

PC Local Interconnect Option

Wang Laboratories, Inc.

One Industrial Ave.

Lowell, MA 01851

(617) 459-5000

List Price: Local Interconnect Option Network, \$600 (includes Professional Network Services software); LIO repeater and one repeater card, \$600; additional repeater cards, \$400; cable, from 10 feet for \$25 to 2,000 feet for \$425.

CIRCLE 667 ON READER SERVICE CARD

"MY SECRET LIFE AS A WRITER"

by "D", Investment Banker



I was always just a banker. Someone who used his computer for things like budgets, projections, and turning numbers into pie charts.

Until one night, I got this uncontrollable urge. Suddenly I had to write. And I had to write fast.

Calmly, I took the Word Result disk from my secretary's desk. I was ready to enter the world of word processing.

I put the disk in my computer. As commands appeared in plain, simple English, I learned how to add, delete, rearrange.

Whenever I got stuck, I just pushed the *Help* button. Instructions telling me exactly what to do would appear on the screen. It was all so simple.

I typed a title on the screen. "The Chick From Fresno." The novel I'd been carrying in my heart for years was finally taking shape.

The next day I bought a Word Result program of my own. I put it in my computer along with my spread sheet program,

Calc Result. Now I can switch back and forth when nobody's looking. Sometimes I even split the screen and do both at once. But I have to be careful the chick from Fresno doesn't end up in the middle of some budget.

It's tough leading a double life. But isn't suffering part of being an artist?

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have to put the screens in a file and then tell the network when you want to print it. The queue on the network printer tells you the status of your print request, whether it is printing or waiting in line to be printed. You can also cancel print requests if you change your mind. The menu system handles all of these tasks, but you can also use standalone MS-DOS programs to perform them.

Bi level Protection

Network security is handled at two levels. At the networkwide level, you must log on before using any network services. The second level resembles the file-protection scheme that UNIX and other operating systems use: Each file has access protection for owner, group, and network, and you can designate a file in each of these categories as read/write, read-only, or no access. Thus, a certain file might allow read/write access for the owner, read-only access for those in the same group, and no access for the rest of the users on the network. These protection codes are stored in some unused bytes of the MS-DOS File Control Block. Because the only way you get to these files from another Wang PC is through the Professional Network Services software, the software makes sure that you cannot circumvent its access protection scheme. You can also either enable or disable concurrent access to a file, which amounts to the same thing as file-level locking. The software has no built-in facility for record-level locking. In fact, very few networks offer this feature, which is extremely useful for working with databases.

Installation of both the LIO hardware and Professional Network Services software is simple and requires no real knowledge of networks. You need to make only two decisions: what node number to use on the thumbwheel switch of the LIO board and what node name to use. A menu system in the software helps you with installation and leaves little room for error. To install your Wang PC to the rest of the network, you simply hook up both ends of the coaxial cable. None of the other nodes in the network need to be reconfigured, and the installation of your new node will not interrupt the other nodes' work. Even if you do something wrong, such as choos-

ing a node number already in use on the network, the network will not be adversely affected—it just won't recognize your node. Because the configuration of the network is dynamic, the network will recognize and communicate with your PC as soon as you install the network software on your PC and attach its coaxial cable. Alternatively, if you prefer, you can install the cable first; your node will be recognized just as soon as you install the software.

Wang's PC network allows for two different kinds of gateways, or bridges to mainframes. The first, of interest to companies that already have an operating WangNet, allows one personal computer to serve as a gateway to a broadband WangNet. This gateway, in turn, permits the other PCs on the LIO network to participate in such WangNet services as electronic mail. The WangNet gateway does not allow the other PCs on the LIO network to act as terminals for other WangNet hosts such as a Wang VS 1000.

The second kind of gateway, of interest to a wider range of sites, allows PCs on the LIO network to act as 3270 family terminals to an IBM mainframe host by allowing one Wang PC to act as a SDLC 3274-31C control unit. Up to eight of the other PCs on the LIO network can then act as 3278-2 terminals and printers can act as 3287-1 printers. This method is somewhat similar to the way an Imba board lets a single personal computer

act as a 3278 terminal. The Wang 3270 SNA (system network architecture) network gateway allows multiple personal computers to do the same with just one physical connection to the IBM SNA network. This connection could result in considerable saving for those sites that rely heavily on PC-to-IBM-mainframe communications.

The Wang PC network offers only the minimum services: disk access and print-

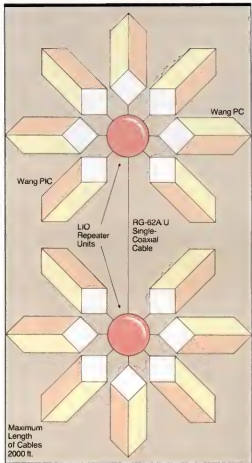


Figure 1: Wang networks of more than two nodes need an LIO repeater, which serves as both a receptacle for multiple connections and a signal booster. Each repeater can accommodate between 8 and 24 nodes, up to 2,000 feet apart.

ing. While these are admittedly essential, such services as electronic mail can make a network extremely attractive. The amount of memory that is required (128K bytes) to handle the available services might present a problem if you couldn't unload the network software when you weren't using it.

Wang's Professional Network Services software is consistently designed and, consequently, simple to use. The network's use of regular MS-DOS pathnames to signify network locations is very nice. And because you can then shortcut this procedure by using a single drive letter, network file access is elegant and yet simple. If you have previously installed network hardware and software, you will find the LIO network's easy installation and configuration a welcome change. The gateway products to WangNet and the 3270 SNA are also well done and offer many capabilities that are not available on most other networks.

At 2.5 million bits per second, LIO is not as fast as some networks. It is hard to tell how well Wang's modified token-passing scheme utilizes that bandwidth. Networks approaching the size of the 255-node maximum might become bogged down handling that much traffic. Even Wang's own documentation states that 64 is a more practical number and should be a sufficient number of nodes for most users.

The lack of dedicated servers may also affect performance. Although, in many cases, having your disk accessed by someone else while you are working may not visibly affect what you are doing, it may bother you at times.

The fact that the network is currently limited to Wang machines and cannot include IBM PCs or compatibles is another problem. Not every office limits itself to just one brand of personal computer, and those that do are more often IBM compatibles than not.

Wang's LIO is a midpriced network. At about \$700 per connection (\$600 per LIO card plus about \$100 for a share in the repeater), it is competitive with other local area networks. Wang PC users don't have many choices, in any case.

Wang's Local Interconnect Network is not the fastest, the cheapest, the most functional, or the jazziest PC network on the market. It is, nonetheless, nicely designed, easy to use, and easy to install. Once again, quietly and unobtrusively, Wang has done a good job in the personal computer marketplace. ■

Bill Catchings works as a programmer at Foundation Computer Systems, a Raleigh, North Carolina, software company that develops fourth-generation computer languages.

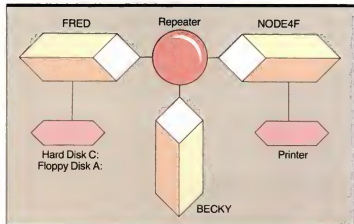


Figure 2: Each node in a Wang network is given a unique name. This name can be functional and impersonal, such as NODE4F, or more descriptive, such as BECKY or FRED.

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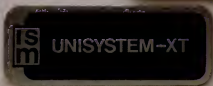
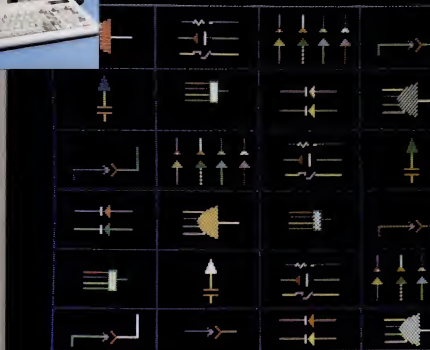
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Transportable Color Graphics

The ISM Express offers a unique combination: high-resolution color graphics and PC-compatibility in a transportable (if clunky) package.

You may not have heard of the ISM Express. You probably won't find it in a local retail outlet, since the machine is marketed mainly to OEMs and value-added resellers (VARs) who require the unique combination of features that it offers. Although the ISM Express looks like just another transportable, International Systems Marketing (ISM) has stuffed an IBM PC-compatible with incredible graphics capabilities and an outstanding 9-inch monitor into its clunky box. The ISM Express (and the Express XT) may not be for everyone, but if your application requires high-powered, portable PC capabilities with color, the ISM could make a strong impression on you.

Form Follows Function

ISM is not a computer giant. It started 11 years ago as a manufacturer's representative for terminals and other peripherals and only recently decided to offer its own portable for some specialized customers.

Instead of reinventing the wheel, ISM pinpointed an open market niche—a portable color/graphics PC—and set out to find the best components available. When you buy an ISM, you get Teac floppy drives (or a Rodine hard disk with the XT version), a Faraday motherboard, Key Tronics keyboard, and a Sony color monitor. You can also tremendously enhance the Express's

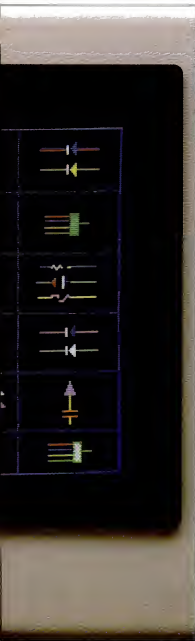
graphics capabilities by adding a Plantronics graphics board or two excellent AT&T video boards. These components—all well-known, reliable names—are assembled by ISM in Maryland. In a sense, it's not too different from what you get when you buy an IBM PC. IBM and most other compatible manufacturers follow the same path of packaging some or all of the components supplied by other vendors. ISM simply doesn't make any bones about it.

Obviously, most of the company's efforts went into finding good components and not into designing a sleek package. The Express's 18- by 20- by 8½-inch off-white case is functional and unprepossessing. Don't be fooled by the case, though; this is a well-designed machine. And while the 4.77-MHz 8088 CPU won't turn any heads, it does eliminate a number of compatibility problems.

It is worth noting that calling the Express transportable is somewhat generous. Most people could carry the 35-pound package from house to car without requiring medical assistance. However, you would have to be a masochist or have spent an awful lot of time pumping iron to not find it weighty.

Superior Color

Since the Express is designed for color graphics, the monitor was obviously crucial; ISM hasn't skimped in this area. The



Express uses a 9-inch, high-resolution, analog RGB display from Sony with a .025-inch dot-pitch. Most monitors claiming high resolution have a dot-pitch of .031 inch; the difference is noticeable. The Sony is easily one of the finest color monitors I have seen, with extremely sharp and well-defined text and graphics. Its analog design lets the Sony monitor reproduce some stunning effects. The color palette is essentially unlimited; it depends on which graphics board you use. With the Plantronics board (ISM claims 95 percent of its units are ordered with this option), 16 superior colors are available. A BASIC demonstration program shows off some of the capabilities with crisp, detailed computer renderings of Reggie Jackson, Pete Townshend, and other celebrities.

The Express's on/off switch and a reset button are located under a lip on the front

The Express performed without a hitch. Its reliability should at least match that of its fine components.

of the machine, where they are easy to reach but difficult to hit accidentally. A brightness control is in the same place.

A recessed panel on the right side contains the standard parallel and serial ports and the connector for the keyboard cable. I liked the Key Tronics keyboard, with some reservations. Keyboard feel is a subjective issue, but real, nevertheless. The Key Tronics's tactile response is a little on the soft side, although quite acceptable. Its LED key-status lights are extremely helpful and enough to make this keyboard an improvement over IBM's.

I used the Express during the course of this review, and it performed without a hitch, which is not surprising considering the high quality of its components. Its long-term reliability should at least match that of its fine individual components.

Compatible?

The Express ran every program I fed it with no problems, including *1-2-3*, *Flight Simulator*, *MultiMate*, *WordStar*, *Multi-*

plan, and all of the IBM BASIC demonstration programs. You might find something that it can't run if you looked long enough, but I was satisfied enough after several hours of shuffling disks to call it a "true compatible."

With an identical CPU installed, the ISM Express performs, not surprisingly, more or less exactly like an IBM PC. (See *PC Magazine's* benchmark test results.) On the benchmarks, the Express clocked in at just a bit faster than the IBM, although the result was close enough to be statistically negligible. Suffice it to say that while the ISM certainly won't set any speed records (not with the 4.77 MHz clock speed), it won't disappoint you if you're satisfied with the performance of a basic IBM PC.

A Different Beast

The main reason you probably won't see the Express at your local computer store is that ISM had no desire to slug it out in the compatible market. From the start, it has directed the Express toward VARs, OEMs, and end users who need both IBM PC-compatibility and superior color graphics in a portable package.

With a Plantronics board (or compatible) in place, the Express is excellent for presentation graphics, CAD, or other art and graphics applications. The image on

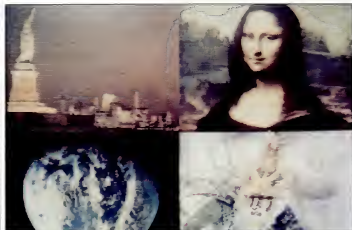
the Sony monitor is about as good as you can get from that class of portable or desktop monitor. The ability to carry an impressive color graphics demonstration from site to site with relative ease is very attractive for some users.

With the addition of either or both of the AT&T boards (the Video Display Adapter and the Image Capture Board), the Express takes on a totally new dimension. The Video Display Adapter (VDA) allows you to display previously captured digitized images of all types: photographs, maps, engineering drawings, and so on. The Image Capture Board lets you capture these types of images directly to the PC. While not yet essential for most, these features are on the leading edge of a growing trend in PC use. You can display and/or capture virtually any sort of digitized im-



ISM Express
Express XT
 International Systems
 Marketing
 18946 Bonanza Way
 Gaithersburg, MD 20879
 (301) 670-1813
 List Price: Express, \$3,195; XT-10,
 \$4,695; XT-20, \$4,995.

CIRCLE 699 ON READER SERVICE CARD



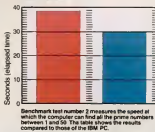
The images in this montage were created with a video camera. The VCR was tied into the ISM Express system, the desired frame frozen, and the image stored.

PC BENCHMARK

ISM Express Disk I/O



Prime Number Calculation



age on the Express with high-quality, color-television reproduction. Instead of the distinctive dot patterns common to computer graphics, you'll see the continuous-tone picture you expect from your color TV set. The effect of continuous-tone, photographic-quality images on a computer is stunning.

The AT&T boards allow you to use the Express as a Videotex terminal or image analysis machine, as an AT&T Sceptre terminal, for photographic-quality database capture and display, to support the NAPLPS graphics standards, and for a number of other applications that are just now being explored. For example, large

corporations or government organizations could use the Express for security applications. High-quality color "photographs" of employees could be easily stored and recalled for security checks. There is little doubt that new applications will be developed quickly for this technology.

What Price Impressiveness?

The ISM Express offers some very impressive capabilities in a package that is, if not small, at least manageable. The base price for that package is \$3,195, including 256K bytes of RAM, serial and parallel ports, two floppy drives, DOS, GW-BASIC, and the Sony monitor with a color

graphics card. The XT version, which substitutes a 10-megabyte hard disk for one of the floppies, lists for \$4,695, and a 20-megabyte version is available for \$4,995. As I mentioned, the Plantronics (or compatible) color board will add about \$200 to the system price although an ISM spokesman said the company plans to switch to an AST board that would offer the same features for a lower cost.

The AT&T boards don't come cheaply. The VDA board lists for \$695 and the Image Capture Board will set you back a whopping \$1,295. Clearly, with these options, the Express is not for everyone.

The current version of the motherboard affords three empty expansion slots with the PC version and two with the XT version (based on the 5-slot motherboard with the necessary cards installed). ISM plans to offer an AT-compatible version and will probably switch to a chassis with an 8-slot motherboard for all of its models.

If you simply need color graphics, you can put together a PC-compatible color graphics system for less than the price of the ISM Express. And if you are looking for a transportable PC, there are less-expensive options. But if you are one of the specialized users for which the Express is intended, it might be your best choice. You're unlikely to find PC compatibility and stunning color graphics in a portable package for less. And if you need Videotex and digitized image capabilities, the Express stands alone. ■



This extended image, composed of 256 simultaneous colors, demonstrates the powerful graphics capability of the ISM Express equipped with AT&T boards.

Jon Pepper is a technical writer and runs a letterpress print shop in Vermont.



Networking Raised to a Greater Power

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A Flexible Formula for Application Generation

It takes a long time to write a good program. Whether you work in assembly language, BASIC, or a unique procedural programming language like *I-2-3's* macros, you must consider many details and follow a rigid syntax. Any major code-writing project seems doomed to include trial and error and frustration. But programs called application generators can provide a faster and more efficient way of creating a final program. Although various categories of software use application-generator concepts, the term is usually associated with database management systems.

Formula IV, the latest release in a series of database management system (DBMS) programs from Dynamic Microprocessor Associates, contains application-generation features that are a substantial improvement over what has been available previously. The package also includes a procedural language and a query language that allows you to get information out of the database without writing a formal program. In addition, *Formula IV's* general database manage-

ment capabilities put it in a category with such sophisticated high-end programs as *Condor 3*, *dBASE II*, *Metafile*, and *Probase*. It is written in C, and versions are available for a wide variety of personal computers, including multiuser systems (see sidebar, "Multitasking with *Formula IV*").

An application generator is a program-within-a-program that creates a tailored set of functions in response to your input, which could be in the form of graphic designs on-screen, answers to questions, or selections from menus. As you give the application generator information and describe functions you want performed, it retrieves appropriate prestored

ment capabilities put it in a category with such sophisticated high-end programs as *Condor 3*, *dBASE II*, *Metafile*, and *Probase*. It is written in C, and versions are available for a wide variety of personal computers, including multiuser systems (see sidebar, "Multitasking with *Formula IV*").

routines or lines of code and puts them together into a tailored application program for you. The final result might be in BASIC or in a program-unique procedural language.

Early Generators

One relatively early DBMS/application-generator program for the PC was *Next Step* from Aeronca, Inc. This program, which is no longer available, allowed you to use graphic building blocks to design data input and retrieval screens. As you constructed the screens, the relationships between the fields and information, such as the size of the fields and their content, were described. The application generator tailored programs in BASIC that the DBMS followed to manipulate the data in the fields according to the way it was described in the on-screen forms.

Another program containing application-generator functions is *Infoscope* from Microstuf. *Infoscope* combines graphic inputs with the answers to questions asked by the program to tailor data selection and presentation.

Next Step and *Infoscope* focus on being easy to use, but both lack certain powerful DBMS features such as the ability to search and correlate between two or more files simultaneously or to create prestored reports. *Formula IV* combines an application generator with these powerful data manipulation features.

Considering its power, setting up *Formula IV* is very simple. The program is not copy protected, and it can be easily read into a subdirectory on a hard disk. Although it is theoretically possible to use this program on a machine equipped only with floppy disk drives, it would be difficult. Because of the large number of over-

PC FILE

Formula IV

Dynamic Microprocessor Associates

545 Fifth Ave., #1103
New York, NY 10017
(212) 687-7115

List Price: \$695

Requires: 256K RAM, two disk drives or a hard disk, DOS 2.x.

CIRCLE 664 ON READER SERVICE CARD

Multitasking with Formula IV

Formula IV's multiuser environment offers many advantages, including added functionality. Making the best use of these capabilities, however, will take a serious investment of time and effort.

One of the selling points of *Formula IV* is its multiuser environment, in which several users, across the room or across the country, can use a *Formula IV*-generated application simultaneously. This multiuser capability is valuable if your daily volume of work on the application is more than one person can handle. It's also worthwhile if you need to have different people doing different kinds of transactions on the system or if the tasks have to be done from different locations. An added bonus of multiuser systems is that they easily enable you to limit file access through the use of passwords.

However, a *Formula IV* multiuser application still accesses the host PC's single processor; it's not doing multiprocessing. A single processor can only do one operation at a time, but a multiuser system gives the appearance of doing multiple tasks simultaneously by interleaving the operations, preferably at a rapid enough rate to keep users happy.

Formula IV has confused the lingo by referring to its multiuser capability, which in most other circles is known as multitasking. Multitasking means that the several users and their respective tasks are sharing programs, memory, and most importantly, files. Since there is no longer just one user, the system must give the illusion that each of several users is still the master of the PC—while keeping them from clobbering each other.

Formula IV polices the multiple uses of the application in several ways. The most important of these is its methods of handling file access. These techniques of file and record locking allow a user to share a file or have exclusive use of it and guarantee that two users don't simulta-

neously update a record. Secondly, *Formula IV*'s dynamic memory management sees to it that only one copy of a program module is loaded into memory, which users then share. The third control is dynamic file extension, which enables multiple users to add records to a file concurrently.

Making It Work

There are both programming and hardware aspects to planning a successful multiuser environment in *Formula IV*. You must keep in mind the type of file access that each of the *Formula IV* modules uses as you design your application. Then you won't be surprised when, for instance, one user has to sit and wait to update record A because someone else is extensively modifying record A. *Formula IV*'s multiuser reference manual indicates which files are used in exclusive mode or share mode by each module and thoroughly describes how each module behaves in various multiuser situations, as well.

Setting up the hardware for a multiuser application, however, requires some additional planning and installation. You'll have to describe to *Formula IV* how many users there will be, the communications parameters for each user, and the keyboard and screen codes for each terminal. You describe these parameters to *Formula IV* by using the menus of the multiuser setup utility *MU-SETUP*.

The first set of menus configures the system. You tell the system the maximum amount of memory that is available to the *Formula IV* application and how much of this is to be set aside for each user's data. The manual gives a rather elab-

orate but clearly explained algorithm for determining the best allocation of user data memory based on your total memory and the number of users.

An unenhanced PC has only two COM ports. When it is the host, the maximum number of additional users is two since the host needs an asynchronous communications adapter for each user that is to be connected to it. *Formula IV* recommends using Control Technologies Corporation's HOSTESS 8 port serial adapter to bring up the number of users to 6.

No matter how many ports you use, you'll have to set communications parameters such as baud rate, number of stop bits, and parity for each one, just as you do with a communications program. This is necessary whether the terminals are local ones, connected to the host PC by cable, or are remote sites linked by modem and telephone line.

The second set of menus is for user initialization. You employ these menus to describe each user location in terms of the communications port, console, and printer it's using. *Formula IV* has an MS-DOS printer driver that it suggests using instead of the usual LPT1, 2, or 3. This driver gives you exclusive control of the printer so that there's absolutely no chance of two users' text intermingling as they print.

Attaching Terminals

Formula IV accepts almost any terminal or terminal-emulating PC as a user. The price of this great flexibility is that, unless each user's screen and keyboard codes exactly match those in the default CRTCTL file, you'll have to create a new file and modify the codes. *Formula IV* could have saved the user this kind of painstaking labor by preparing CRTCTL files for the major possibilities and presenting a list of these for the user to choose from.

You can use a second PC as a *Formula IV* terminal by connecting it to the host PC via modem and using one of the communications packages that support terminal emulation, such as *Crossstalk*. Once

the two PCs are communicating via modem, the user at the host PC will have to start the *Formula IV* application so that the user at the second PC can access it. The user at the host end can save several steps by placing this series of commands into the communications package's batch file.

There are two points to consider if you're thinking about using *Formula IV*'s multiuser—or any multiuser—environment. It's important to carefully weigh your needs against what a multiuser environment can offer. If you expect to have different people enter different kinds of transactions, or if you need to have data entered from different locations, then a multiuser, single-processor system such as *Formula IV* may be satisfactory. But if your volume of data processing activity is large enough to require the daily attention of more than one person, then one PC's computing power, memory, and storage may not be sufficient to support the task. In addition, the program's response time will degrade as the number of users increases on a single-processor system.

The PC AT, with its additional power and speed, will be better able to handle several users than an XT will. But you may find that a network arrangement or a more powerful host computer is what you need. Determining your needs and calculating the demands they will make on your computing resources should be one of the first steps in the analysis process, well before designing the application.

The second consideration in setting up *Formula IV*'s multiuser environment is that it is not a job for a novice. *Formula IV* makes ample use of menus and has made a real effort to explain what has to be done in the manual. Nevertheless, the hardware still has to be set up correctly and many parameters have to be entered, all of which take time and patience. *Formula IV*'s multiuser environment is a worthwhile enhancement to its application generator, but it will take a real commitment of time and energy to work out the kinks.—Stephanie Stallings

lays and the file-oriented nature of a DBMS, it makes sense to use programs of this type on a machine equipped with a hard disk.

The authors of *Formula IV* designed their product to work well with the directory file structure in DOS 2.x: The program can find data files in subdirectories and follow DOS path names. You don't have to keep multiple copies of the DBMS even if you segregate data files into different subdirectories.

Almost everything in *Formula IV*, from setup to report generation, is menu driven. The menus gather the information that the application generator uses to create the final product.

A feature that could be very valuable if you change or upgrade equipment is the program's designation of logical disk drives. You can easily equate the logical drive designations the program uses with any physical drives in your machine. If you add another hard disk or start to use a RAMdisk, you don't have to rewrite the entire program to change drive designators. A couple of keystrokes will let *Formula IV* know that all files called D:.* in the DBMS program are really located on drive C:.

Generating Applications

Almost everything in *Formula IV*, from setup to report generation, is menu driven. The menus lead you through choices or ask you to fill in blanks, and the well-written help screens are keyed to the menus. The menus gather the information that the application generator uses to create the final product. They flow smoothly and make it hard for you to forget any important steps.

One nice feature of the *Formula IV* database creation program is the ability to put together menus that will guide people as they use the DBMS you create. You can create menus calling for different functions such as data entry, data editing, or report

FORMULA IV

generation. You can also list formal reports to be run as items on a menu.

Over 100 help screens are available to you as part of a program-wide context-sensitive help system that is invoked by hitting F10. In addition, the application-generation portion of *Formula IV* has over 90 clearly written error messages that are helpful in figuring out what might have gone wrong.

Even with all of this help, *Formula IV* is not for novice users. You need to know something about DBMSs in general, and your application in particular, before you can really make good use of the program. Generating forms and standard reports can be particularly complex.

As an example, when you begin to use the application generator, the first major step is to define the data fields that will appear in each record (see Figure 1). You tell the program the name of each field, what type of characters to expect, and how many characters will be in each field. After you have completed the definition step, you move immediately to a menu asking you to establish "key fields." Other database management programs refer to this function as indexing.

The information about these key fields

goes into an index file used by the program during complex searches. The designations in this index file determine the efficiency of the program. Poor designations can cause the DBMS to grind for many minutes on projects that might take seconds if a good index file is used. The index file can be changed after data is entered,

Formula IV is not for novice users. You need to know something about DBMSs in general, and your application in particular, before you can really make good use of the program.

but the process is cumbersome and it must be done carefully. If you don't know something about how database systems work and what pieces of data will normally be associated with each other when you are building the index file, the application generator doesn't help you much.

The application generator also doesn't

help you much when you design formatted reports. You have to enter program statements into a form-definition menu to build reports that will format data on the printed page. The application generator checks your work for syntax and logic, but this is the only time when you produce the code with the application generator looking over your shoulder.

Formula IV's program-creation screens include special prompts, and some screens make use of sliding-window command selection (as in *Multiplan* or *1-2-3*), on-screen prompts, and other features. If you are curious to know what goes on behind the scenes, or if the application doesn't work, *Formula IV* will produce a listing of the program code for the file definitions and form-generation instructions. This listing is particularly helpful in situations where the information you asked the DBMS to develop isn't printing out correctly because you didn't put enough space in the report form.

Database Management

The application generator in *Formula IV* is well integrated with the DBMS. A main function menu through which you move from one application to the other makes the transition between creating the commands and running them effortless.

The DBMS specifications show that *Formula IV* has a large appetite for data. Its theoretical limit is almost a million records of over 10,000 characters each per file. A report can incorporate data from as many as 12 files at a time. The practical limitations of disk storage, however, will probably keep you from reaching the program's outer capacity limit.

Other general capabilities of the *Formula IV* DBMS include password security for certain modules, mathematical functions such as count and average, and data-entry editing. The entry editing function does automatic screening of data as it is entered into the DBMS so that incorrect inputs (by type or length) are caught immediately. The program can also automatically convert dates into one of several different forms. Advanced programmers can use a lookup table to verify inputs or require data to be input twice, but these are not options available through the application generator. A very useful update feature performs

```

ENTER DATA FOR FIELD 1 -- B:PCTEST.DAT

1. Field description..... Customer No
2. Field name (cc:field000) CUSTNR
3. Type(A, I, L, T, D, M) . A
4. Field length ..... 5
5. Lower Limit ..... 0
6. Upper Limit ..... 5
7. Decimal places .....
8. Restrict (D,J,M,Y or cp)

-----
  IT#  FILE      FIELD  OPT  IT#  FILE      FIELD  OPT
-----
   9.  10.      11.      12.
  10.  11.      12.      13.
  11.  12.      13.      14.

Item number to change ((CR) if none):
  
```

Figure 1: This menu, which is the heart of the application generator, defines the fields that appear in each record. Fields 9 through 14 allow related fields that are located in different files to be updated automatically.

FORMULA IV

a multiple update on a data item even if it appears in several different files.

One useful feature that *Formula IV* lacks is the ability to easily import data files from other commonly used database and spreadsheet programs; it accepts only files that are in rigid ASCII format. *Formula IV* can, however, create files in the commonly used DIF format.

The effort to make *Formula IV* work on many different machines has resulted in one drawback: The data input screens automatically created for the DBMS are dull. Many modern database programs use color, physical position on the screen, highlighting, blinking, and other visual effects to give cues and assistance to users during what can be a long and dreary keyboard drill. It is difficult to incorporate video features such as these into a program designed to be used on many different types of displays. You can enter programming statements into a form-definition program to add color and video features to the screens, but this can not be done through the application generator.

Ordering Out

Formula IV offers you two ways to get information out of the database: a query language system for informal reports or a formal report generator. Both features are powerful and useful.

Query languages have become important in database systems over the last few years for the same reasons people use application generators: speed and efficiency. A query language gives you the capability to phrase a request for information using English-language commands and relatively loose rules of syntax. For example, the query language statement, "PRINT NAME, ADDRESS, CITY, STATE, ZIP WHERE ZIP = 10016" tells the program to feed the printer a list of everybody in your database with that zip code. The list would not be formatted or have fancy headings, but the response would be fast and efficient (see Figure 2).

The query language and its associated menu are easy to use. The *Formula IV* screens have an on-screen editing capability, so you can examine and edit the query command before it is executed. Queries can be specified in explicit detail, and it is possible to use conditional statements such

as WHERE, WHEN, and IF in queries.

There are, however, times when you want nicely formatted reports and times when you want formal reports that can be easily produced on a regular basis. It's no coincidence that a significant portion of the *Formula IV* instruction manual and tutorial are dedicated to using the report genera-

tor—it's the most difficult part of the program to work with. The report-generation menu (see Figure 3) has some helpful prompts and the application generator will keep an eye on your work, but you still have a large task ahead if you want the program to prepare specialized reports. You have to understand the data-selection and

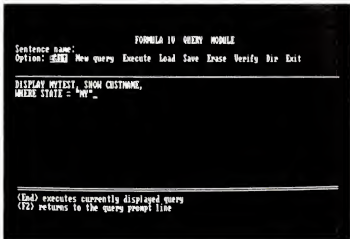


Figure 2: *Formula IV*'s query module generates fast, but not fancy, reports.

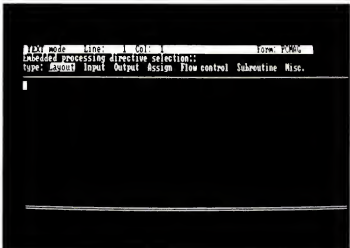


Figure 3: The form definition menu permits you to design formal reports by selecting from the tiers of commands. The sliding window selection forestalls the need to learn a programming language, but the process is lengthy and complex.

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FORMULA IV

printing processes and the *Formula IV* command language to be successful.

The report generator can produce reports using many variables and functions, but if you want special screen designs and output formats, you will have to become involved in the niceties of the program's unique procedural language. Once you've mastered the procedure, however, you can generate reports with labels, special head-

Formula IV does make application generation accessible to the average business user. When it comes to creating and formatting reports, however, ease of use goes out the window.

ings, and inserted notes. You can string separate reports together into a chain that can be executed by people who don't have much knowledge of DBMS operations. Reports can be nicely formatted on the page, and portions of the report can be reprinted if you need multiple copies.

Documentation

The manual for *Formula IV* includes detailed descriptions of the procedural language and the query language, a good in-

dex, and an excellent table of contents. Its value is mainly as a reference; a separate tutorial gives examples of how the program can be used and includes illustrations of the screens you will see. You need both books if you are going to successfully use the program, and even then there is a gap between the simplicity of the tutorial and the terse explanations of the manual. The documentation does not contain a phone number to call for those who need customer support.

Formula IV is a powerful program that can help you by shortcutting the file-definition and data-field description steps. The application generator lets you avoid many common problems involved in programming a DBMS while still producing powerful DBMS application programs.

The manual claims that *Formula IV* makes application generation accessible to the average business user, and to some extent this is true. The average person could work through *Formula IV*'s program-creation menus about as quickly as an expert SQL (Sequential Query Language) or *dBASE* programmer could put together the file-definition and data-entry portions of an application in one of those languages. The query language is also useful for informal reports.

But when it comes to creating and formatting formal reports in *Formula IV*, ease of use goes out the window. The average business user might as well call in the programmers. ■

Formula IV: Features and Performance

Number of records per file	one billion
Number of files open at once	12
Number of screens per file	unlimited
Number of fields per record	200
Field types	alphanumeric, integer, long integer, floating point, date
Date math calculations	yes
Reports	
Change column headings	yes
Multiple lines/record	yes
Calculated fields	yes
Subtotals	yes
page break	yes
no. of levels	unlimited
No. of files per report	12



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Microcomputer-based expert systems have been justly criticized for their high prices, mediocre performance, and lack of contact with the real world of data processing.

Early micro-based systems, spinoffs of university artificial intelligence research, were weighed down by the enormous tasks they tackled: complex medical, engineering, or chemical analysis. Many of these were developed in LISP and PROLOG, special "AI languages" that perform well on mainframe equipment but tend to be slow and cumbersome on the PC.

While a new wave of expert-system development packages designed for the business environment have recently emerged, many still share the same failings. Some are example-based systems designed to make knowledge-base rule creation easy for the novice user, while others are for the serious PROLOG or LISP programmer developing expert-systems applications. But these programs are for the most part either limited or expensive and are slow to boot.

One new trend in expert-system software that may overcome these drawbacks is to combine knowl-



A New Insight Into **EXPERT SYSTEMS**

Insight 2 represents a new generation of microcomputer expert systems. It combines artificial intelligence technology with traditional programming tools and offers dBASE compatibility.

edge representation with the speed and complexity of more-familiar high-level programming languages. *Insight 2*, an expert-system development program from Level Five Research of Melbourne Beach, Florida, is a fast but relatively inexpensive example of this new breed. At the premium price of \$485, *Insight 2* is a more powerful version of the company's earlier *Insight KS* priced at \$95.

Insight 2 is written in compiled Pascal, a design choice that allows the program to avoid the overhead of interpreted languages such as PROLOG and LISP, according to Level Five president Henry Seiler. However, it meant Seiler and his design team couldn't use the built-in inference engines that these languages offer. "We had to develop our own," Seiler says.

Insight 2 actually incorporates a mini-Pascal compiler called DBPAS that gives expert-systems developers access to Pascal programs. The compiler also includes statements in the *dBASE II* language that allow you to produce and use already-created *dBASE II*-format files. The program uses a source code compiler to shrink your knowledge-base text files into their most disk- and memory-efficient form.

Because of these "conventional" features, *Insight 2* won't seem like completely uncharted territory if you have no experience with expert systems. They also make *Insight 2* much faster than PROLOG-based software. While I didn't run comparative benchmarks, I never fretted over how long *Insight 2* took to complete a particular job.

If you are an experienced Pascal or *dBASE II* programmer, these features give you a great deal of freedom to incorporate constructs that these languages handle more capably than does an expert-system knowledge base. You could use Pascal to

solve complex statistical or mathematical problems, for instance, to calculate rates of return in a banking application that advises users on choosing portfolio structures. Or you could use an already existing *dBASE II* database as source material for your expert system. Seiler cites an example of a finan-

**Insight 2 uses a
"backward chaining"
approach: Your knowledge
base starts off with a
conclusion or goal, then
sets off to find
evidence that will prove
or disprove it.**

cial decision-making expert system that uses a database on corporate performance.

The compatibility also works in the other direction. The *Insight 2* program could serve as an "intelligent" interface for a *dBASE II* database, placing the expertise of an experienced user at the disposal of a novice. Such an interface would question users about the object of their searches, using the answers to formulate queries to the database.

Developing a Knowledge Base

Insight 2, a menu-driven system, requires you to select options using the keyboard function keys. The first screen offers you a choice of loading, editing, and running expert-system programs, Pascal programs, and database programs.

In building an expert system your first step is to create a text file using *Insight 2*'s Production Rule Language format. Production rules, in AI terms, encode knowledge in the rather straightforward form of if-then or if-then-else statements that use some reserved words. These types of statements are the basic building blocks of most expert-system knowledge bases. You can represent pretty much anything with this format providing you supply enough of these rules to cope with the complexity of a situation.

Since expert systems often have to deal with incomplete or uncertain ("fuzzy," in AI jargon) information, your knowledge

base may include probability threshold statements, which filter out all conclusions with a value below a stated level, and certainty or confidence factors, which tag specific rule conclusions with degrees of probability given specific circumstances.

Insight 2's production rule format imposes a structure on you: you don't have to start from scratch, and the format of knowledge base is so explicit that you don't have to worry about how to build it. On the other hand, you don't have the flexibility that you do with other expert systems.

Figure 1 shows how you might arrange a very simple knowledge base. In addition to the reserved words shown in Figure 1, many others also have specific meanings, including CHAIN, CALL, RETURN, SEND, RECEIVE, DISPLAY, CYCLE, and BAR. *Insight 2* recognizes these words as reserved words only if they are capitalized. However, you may use the same words in upper- and lowercase in titles or other explanatory text without conflict.

Specifying Goals in Detail

While many expert systems allow you to set up rules in a similar manner, *Insight 2* allows you to add almost limitless detail to the end goal with a whole collection of linked subroutines. You add finer and finer detail in much the same way that you would use Ashton-Tate's *Framework* to create "parent" text. For example, you might create a multilevel end goal in the following manner:

1. The animal is a bird
 - 1.1. The bird is a finch
 - 1.1.1. It is a golden finch
2. The animal is a mammal.

Insight 2 uses a "backward chaining" approach: Your knowledge base starts with a conclusion or goal and then sets off to find any evidence that will prove, or disprove, that conclusion. By constructing the knowledge base differently, you can also employ forward chaining, a deductive process in which the expert system acquires a collection of facts in an attempt to infer conclusions. Your choice of which approach to use will depend upon the application.

PC

Insight 2

Level Five Research
4980 S. A1A Hwy.
Melbourne Beach, FL 32951
(305) 729-9046
List Price: \$485

Requires: 448K RAM; two double-sided floppy disk drives, a high-density floppy disk drive, or a hard disk; DOS 2.0 or later.

CIRCLE 166 ON READER SERVICE CARD

All of this goes in a simple ASCII text file. *Insight 2's* own text editor has a single main command menu that lists all but a few of the familiar control key combinations that you'll need to get around on the screen; it disappears from view when you enter edit mode, but you can recall the menu by hitting the Esc key twice. The text editor is fine for developing files up to 32K bytes in size, but if you want a bigger knowledge base file, you'll have to start using a program such as *WordStar*. More often than not, I used the nondocument mode of *WordStar*. However, because *Insight 2* automatically appends the extension .PRL to all files that are created internally and it will not recognize and, therefore, will not compile files with other extensions, you should make a habit of supplying the .PRL extension to all your knowledge-base files if you use a program such as *WordStar*.

Not a Standard Pascal

My favorite *Insight 2* feature is its ability to have knowledge bases call *dBASE*-style files or programs written in Pascal. *Insight 2's* DBPAS, an extended Pascal, follows the usual program header/program block format.

To pass parameters to a DBPAS program from a knowledge base, you use the CALL and SEND statements. So the knowledge base excerpt "CALL PAS-PROG SEND PARAMETER1 SEND PARAMETER2" would open a Pascal program called PASPROG and then send the values of PARAMETER1 and PARAMETER2 to that program. To find out what happened to the data you sent, you would use the RECEIVE statement: the word RECEIVE followed by a variable label (such as RECEIVE XYZ) that corresponds to the Pascal program variable holding the value you require.

For this kind of interaction to take place, *Insight 2* requires that the Pascal program be readily available on disk in a compiled form (identified by the extension .PCO). Figure 2 shows an example of a complex expert-system program that includes calls to a Pascal program and returns from that program.

It is possible, if you wish, to combine your knowledge base with programs you have already written using a high-level

language, such as standard Pascal, C, or BASIC. In this case, you would use the SEND and RETURN statements instead of SEND and RECEIVE. *Insight 2's* documentation explains two constraints on using external program calls: only 32 parameters can be passed between programs, and

you will need to have available at least 384K bytes of RAM.

dBASE Connection

For interacting with *dBASE II* files, DBPAS uses special database statements. The DBPAS statements that allow this interaction are modeled, as the manual indicates, on such interactive *dBASE II* commands as APPEND, CLOSE, and OPEN. To take advantage of these database statements you must first declare the structure of any database that you will be using. A reserved word, RECORD, is used for this purpose along with a list of field name and field type declarations.

DBPAS allows you to have up to four database files open concurrently. If you don't already have *dBASE II*, *Insight 2* includes a very simple but compatible database generator that is driven by a menu in-

My favorite *Insight 2* feature is its ability to have knowledge bases call *dBASE*-style files or programs written in Pascal. *Insight 2* requires the Pascal program to be in a compiled form.

```

{ * Lines that begin with an "!" are comments only. *
! The following word "TITLE" is a reserved word which
! you follow with any title of your choice.
!
TITLE YOUR TITLE GOES HERE
!
! To set up the degree of confidence that will be necessary
! to come to a conclusion place a value between 0 to 100 after
! the reserved word "THRESHOLD"
!
THRESHOLD = 85
!
! Insight 2 goals are defined by simply listing them in 1 to n
! order.
!
1. The substance is sugar
2. The substance is salt
!
!
RULE For substance is sugar
IF The substance is granular
AND The substance is white
AND The substance is sweet
THEN The substance is sugar
!
!
RULE For substance is salt
IF The substance is granular
AND The substance is white
AND NOT the substance is sweet
THEN The substance is salt
!
! You must include an "END" to indicate that no other statements
! follow
!
END

```

Figure 1: This simple *Insight 2* expert system knowledge base distinguishes between salt and sugar. It includes a list of all possible conclusions, which are called goals. It also includes the two accompanying rules by which the program reaches a goal.



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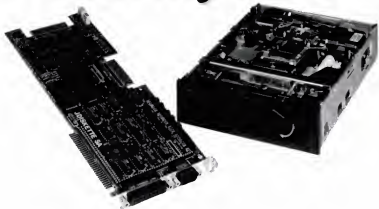
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CIRCLE 172 ON READER SERVICE CARD

Improving the PC's Family Ties



Tall Tree's powerful JDISKETTE system makes PC and XT disks compatible with the AT's high-density format by tightly packing more data on a 360K-byte disk than a standard floppy drive does.

Among the reasons PC users covet the AT is its 1.2-megabyte floppy disk drive, which runs disks that can store 3½ times as much data as a normal floppy. Useful as it is for improving hard-disk backup capabilities, this high-density disk system is the cause of a compatibility problem between the AT and its older cousins, the PC and the XT: While the AT's high-density drive can read standard 360K-byte floppy disks, it can't write to them. The PC and XT's normal drives can't read or write to the high-density disks.

Tall Tree Systems of Palo Alto, California, attempts to resolve this family problem with JDISKETTE, a new plug-in peripheral for the PC that supports the AT's floppy format. JDISKETTE includes a disk controller board that can drive up to four disk drives, a TEAC 55G/F 1.2-megabyte half-height disk drive, a Y-adaptor power cable, and a drive data cable. The system also comes with JFORMAT2

software that serves as an interface between DOS and the high-density disks.

Power-Hungry Drives

The JDISKETTE system fits into one of the drive slots in the front of the PC. As such, the disk drive does not have its own power supply or cabinet—an advantage for users with little desk space but a drawback for those with a PC already filled with power-hungry peripherals and boards. (XT owners will not have power problems because of the larger XT power supply.) I tested JDISKETTE with a standard PC packed with four expansion boards, one full-height drive, and two half-height drives, including the JDISKETTE drive. Even with the often-maligned 63.5-watt standard power supply running the show, I experienced no power problems. If necessary, however, you can easily buy a power-supply upgrade from most dealers.

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40	4,400	6,500	4,700	3,300	2,700
41	1,700	3,400	5,500	8,800	8,000
42	9,000	30,000	10,000	10,000	10,000
43	5,850	19,500	11,700	11,700	11,700
44	2,100	6,600	6,600	6,600	6,600
45	2,500	2,500	2,500	2,500	2,500
46	500	2,000	1,000	3,000	3,000
47	300	400	500	750	750
48	5,760	5,760	5,760	5,760	5,760
49	230	285	320	335	345
50	7,500	5,000	1,000	1,000	1,000
51	5,000	5,000	5,000	5,000	5,000
52		9,500			
53			2,500		2,500
54	1,500	750	750	1,000	750
55					

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JDISKETTE

The TEAC drive fits in a standard half-height space so you can mount it as a companion to a regular 360K-byte half-height drive. If you plan on replacing a standard full-height floppy drive with JDISKETTE, you'll have to add a bezel (available from computer-supply stores) to cover the gaping hole in the front panel of your PC. Be careful when sliding the drives into the mounting slot, because sloppy handling can easily damage the exposed components on the drives' printed circuit boards.

The JDISKETTE disk controller board, intended to replace the old IBM disk controller board, has two connectors available for drive data cables. The first is for drives A: and B: and the second is for drives C: and D:. Unlike the IBM disk controller, this board has no provision for connecting external drives. A typical installation might include one or two regular floppies, one or two JDISKETTES, and an optional hard disk, which requires its own controller. The JDISKETTE board uses standard IBM-type data cables with edge connector sockets at each end. A power cord Y-adaptor, which can transmit power from the PC's power supply to the TEAC disk drive, comes with the system.

You can set the jumpers on the JDISKETTE controller board to configure it for various combinations of both regular 360K-byte and 1.2-megabyte disk drives. But Tall Tree presets the board to reflect the most common situation: Drives A: and B: are the standard drives and drive C: is the 1.2-megabyte drive. If you don't have to remove any regular floppy drives when you install JDISKETTE, you do not have to change the system board switch SW1, positions 7 and 8 (which designate the number of regular 360K-byte floppy



JDISKETTE

Tall Tree Systems
1120 San Antonio Rd.
Palo Alto, CA 94303
(415) 964-1980

List Price: \$249, including a controller card, the JFORMAT2 software, and a drive cable.

Requires: I28K RAM, one standard 360K disk drive, DOS 2.x and higher.

CIRCLE 662 ON READER SERVICE CARD

drives present to DOS) because DOS accesses the 1.2-megabyte drives as virtual devices.

The JDISKETTE documentation helps you through the installation, but, in some cases, it is unnecessarily complicated. It consists of 29 typeset 8 1/2- by 11-inch pages, including two diagrams illustrating the position of shunts on the disk controller board. A drawing of the JDISKETTE disk and its power and data cables would be helpful to first-time installers, but for some reason Tall Tree has not included one. The section on the terminator resistor pack (TRP, a chip that helps DOS determine drive letter assignments) is garbled and confusing. In most cases, you do not have to change the TRPs when you install the JDISKETTE disk. Indeed, many systems seem to work perfectly well even if every disk has a TRP in place. If you have never installed a disk, you should seek the help of an experienced person or else be especially careful if you make any changes to the TRP(s) in your system. If you install a TRP in the wrong socket or swap a 1.2-megabyte TRP with a 360K-byte TRP, you might permanently damage the drive's circuitry.

The Jumbo Format

Even DOS 3.0 and 3.1 (which support the AT's 1.2-megabyte disks) do not recognize the JDISKETTE drive's 1.2-megabyte format when used in a PC or XT because a different controller board is in charge. To allow you to use this and several other unorthodox disk formats, Tall Tree includes a device driver, called QDRIVE.BIN, that creates virtual disk drives that DOS 2.x can handle.

To add QDRIVE.BIN to DOS, you must add the command DEVICE=QDRIVE.BIN to the CONFIG.SYS file on your boot disk. Special parameters on this line designate the number and types of disk drives available to the system. For example, the command

DEVICE=QDRIVE.BIN -- J

installs two regular 360K-byte drives, which are represented by the dashes (AS-CII 45), and one 1.2-megabyte drive (J is for jumbo format).

Of course, nothing is ever as simple as it seems: To treat JDISKETTE as a virtual

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OH, YEAH.

	I	J	K	L	M
39	13,650	12,850	12,900	16,350	16,400
40	Note-It				
41	BUDGET				
42	Entertainment expenses are based on the				
43	following:				
44	Sales Force: \$386.00/mth/salesperson				
45	All Others: 25% of travel expenses				
46	Except for company officers who				
47	can spend whatever they want.				
48	K42 is travel expenses				
49	K288 is number of salespersons				
50	ESC - End F2 - Edit F4 - Toggle / - Menu				
51					
52					
53					
54					
55					

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disk drive, QDRIVE.BIN and DOS assign it a new, higher drive letter. If your PC or XT has two regular and one 1.2-megabyte floppies, JDISKETTE assigns two drive letters each to the actual drives A:, B:, and C:. The first drive is assigned the drive letters A: and D; the second, B: and E; and the third, C: and F:. You access the 360K-byte floppies as usual by their real drive names A: and B:, but you access the 1.2-megabyte disk through QDRIVE.BIN as drive F:. PCs or XT's with hard disks and RAMdisks cause more confusion because these disks would usually be assigned drive letter names in between the "real" floppy drive letters and the QDRIVE letters. The actual order of drive letter assignments depends on the order that the device drivers are listed in the CONFIG.SYS file.

The JDISKETTE system is so confusing that its documentation even suggests the easiest way to determine which drive it is by using the DOS DIR command

for each possible drive letter and then watching to see which drive light comes on next. An easier solution would be to clearly label each disk with the drive letters (both DOS's and QDRIVE's) that it responds to. Besides the 1.2-megabyte format used in JDISKETTE, a regular floppy can be formatted and used as a 10-sectored disk under its QDRIVE.BIN name. If such a disk is placed in the first drive (A:), it would be read from or written to under its higher drive letter, D:.

Strangers in the Disk

The confusion in drive letters can lead to some rather dangerous results. Because of a strange interaction between QDRIVE.BIN and a hardware bug in the disk controller system, you get a completely garbled directory, which cannot be cleared without a complete system reboot if you access a disk by the wrong drive letter. Even worse, if you make the mistake while

attempting a disk write, you might scramble and/or irretrievably lose the entire contents of the disk. To avoid these problems, it's better not to use any one-of-a-kind disk in the system until you're completely sure you know which drive is which.

You cannot use DOS's FORMAT.COM with the JDISKETTE drive (or with your standard floppy drives) if you want to make use of the extra formats allowed under QDRIVE.BIN. Instead, you can use a utility called JFORMAT.COM. JFORMAT.COM is a powerful program that formats disks in more than a dozen different formats, including even the 8-inch floppy drives used in older micros. It's also speedy, formatting disks in about two-thirds the time used by DOS's FORMAT command.

Like many powerful programs, however, JFORMAT makes quite a few demands on your attention. To format a floppy in a standard 360K-byte format, you enter

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JDISKETTE

JFORMAT A: /C

JFORMAT's 360K-byte disk size specification is C. A screen showing all the disk format parameters is displayed on the

screen, and drive A's motor and LED are turned on. The format procedure will not take place unless you press the letter Y. You can format several disks in turn by inserting a new disk and entering Y for each.

Assuming the JDISKETTE drive is the third floppy drive installed, you invoke JFORMAT with the command

JFORMAT C: /J
Y

The "J" causes the disk to be formatted in the AT-compatible 1.2-megabyte size. An additional complication with the JDISKETTE system is that JFORMAT.COM does not recognize the drive letter assigned by QDRIVE.BIN but instead uses drive letters beginning from A: and ignores hard disks, device drivers, and so forth. Although a hard disk may be installed as drive C:, you use the command JFORMAT C:/J to format the JDISKETTE drive installed as the third floppy drive in the system I have described. Even when I saw the JDISKETTE drive light respond, it took considerable courage to type the "Y" and format a disk in the JDISKETTE drive C: because I was sure my hard disk's 10 megabytes were about to bite the dust.

To make use of the AT's 1.2-megabyte format, you must use quad-density disks compatible with the AT. These are usually labeled as 96 TPI disks and do not have a hub ring. Older 96 TPI disks with hub rings (such as Dyan's 802067) will not correctly format. The AT quad disks are available for \$2 to \$4 more than the price of standard 360K-byte disks.

JDISKETTE lives up to its claim of making a PC or XT disk-compatible with the AT. In fact, a PC equipped with an add-on hard disk, 2 megabytes of RAM, a JDISKETTE drive package, and, perhaps, a turbo-coprocessor board comes very close to fully emulating an AT. However, JDISKETTE's biggest drawback is its software. They may be powerful, but if you do not install and properly use these programs, you can destroy data on disks because of mistaken drive letter assignments. Obviously, mistakes will decrease once you install the system and adjust to the extra drive letters, but the potential to damage disks by unwary use is always there. As with any powerful product, JDISKETTE can offer a great many advantages, but you must use it with care. ■

Peter Feldmann is a California-based free-lance writer.

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First, we buy the best drives available. Sounds trite, doesn't it? I mean, a drive's a drive—right? Hardly. You should see some of the junk we get in our labs. Some have such high failure rates that we even questioned our own \$10,000 hard disk tester. But when we tested other manufacturers' drives we were assured that our equipment was fine, which just confirmed that the bad hard disks were not only bad—they were real bad.

But that's just the weeding out process. We then take each drive that we've put through our tester and test it again with the controller you've requested. We call this a "tested pair."

DOS Doesn't Do It

In case you're thinking that all

this is an unnecessary duplication of what DOS does for you, let me explain the disk facts of life.

If DOS did what you may think it is supposed to do when you format the disk, DOS would map around these bad areas. Unfortunately, DOS doesn't do this.

DOS 2.0 and 2.1 can't enter the bad tracks. DOS 3.0 can, but only on the IBM AT. Unfortunately, as the press has so well documented, the AT's hard disk develops bad tracks later on.

We do what DOS can't

We believe the problem is so bad, we use a software program that performs a powerful test of your disk drive on all of the IBM or IBM compatible computers—PCs,XTs, and ATs. Our format takes hours to analyze the disk. But when we finish, you know that the bad tracks are really mapped out so you won't write good data that will disappear into a black hole. We even send you a printed statement of our test results.

Our software allows you to type in the bad track locations from the list supplied by the manufacturers, so you'll never write good data to them—even if DOS didn't identify them as bad. The software even lets you save the location of these bad sections to a file, so that you can reformat your disk without spending hours retesting.

We even include a program that will give you continuous comments on the status of your hard disk. No more waiting for that catastrophic failure.

Average Access Time

As you might suspect, some hard disks are faster than others in their ability to move from one track of data to another. The time it takes the hard disk to move one-half way between the beginning of the disk to the end is called the "average access time."

The first generation of 10 megabyte hard disks had average access times of 80-85 milliseconds (msec). But computer users love speed, and guess what—the average access time for the new 20 megabyte hard disk in the IBM AT is only 40 msec. (We sell an AT equivalent with only 30 msec access time!)

There are some legitimate reasons for the shorter access time. It's particularly helpful when there are multiple users on the same hard disk. It's also important when running a compiler. But remember, before you get too wrapped up in the access speed, there's always that ST 506 interface—which won't let data transfer from the hard disk to the computer any faster than 5 megabits/second. We've bypassed that choke hole, too. If you want the functional equivalent of a Ferrari with a turbocharger, order our 10 Mbit per second 100

Compatibility

To be sure that your hard disk is 100 percent compatible with the IBM XT you don't need to buy the same hard disk that's in the XT. You can't even be sure what brand hard disk it is because IBM, like Express Systems, goes into the marketplace and buys hard disks from several vendors. However, they buy their XT hard disk controller from only one vendor—the same one we do.

You can buy the IBM XT controller from IBM for \$495 or you can buy from us, the functional equivalent, manufactured by the same company that makes it for IBM for only \$195. Is it the exactly identical IBM XT controller? No, it's better. First, it takes less power, and secondly, it can control from 5 to 32 megabytes—the IBM controller can work with only 10 megabytes. It is 100 percent IBM XT compatible, and 100 percent is 100 percent. If you want to save a slot, we carry a version that lets you operate two hard disks and two floppy disk drives.

More than 32 Megabytes

You can operate with more than 32 megabytes (the limit of DOS) through the use of "device drivers." Express Systems can supply you with device drivers for our hard disks for over 32 megabytes formatted. But, if you don't have individual files, or databases that are large, you might want to consider one of our controllers that can divide our 65 megabyte (formatted) hard disk into two equal volumes of 32 megabytes each.

Reliability

We offer you a choice between iron oxide and plated media—the stuff that covers the hard disk and gives it its magnetic properties. Iron oxide is, well, it's rust. If you inadvertently yank your disk, you may cause the low flying head to dig out some iron oxide. A little rust flake can ruin your whole day. Plated media is more resistant to damage, and if it happens, less data is lost.

We offer both types of hard disks. The iron oxide is older

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technology, and quite frankly, manufacturers understand it better. Their better understanding, combined with some of the special head locking mechanisms, gives us peace of mind when we sell you one.

Power

Hard disks consume power. Our small, half-inch hard disks consume so little power that you can use them with your existing IBM PC power supply. If you plan to use lots of slots, you'll want to increase your power supply to be safe. We offer the same amount of power for your PC that comes in the XT.

Our Customers

Some folks just never felt comfortable buying mail order. They forget that Sears began as a mail order house or that IBM was now into mail order. But, if it helps, here is a partial list of customers who have felt comfortable buying from us.

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Warranty

We offer you a one year warranty on our hard disks—the same as IBM on the AT and 90 days on the tape drives. (It's all the manufacturer gives us.) If



Complete Hard Disk Kits

Formatted MB	Height	Plated Media	Average Access	Transfer Rate	PC or PC/XT	AT
10	1/2	no	85 msec	5 Mbits/s	\$ 395	\$ N/A
10	1/2	yes	85 msec	5 Mbits/s	\$ 495	\$ N/A
21	1/2	yes	85 msec	5 Mbits/s	\$ 795	\$ 595
21	Full	no	30 msec	5 Mbits/s	\$ 1,535	\$ 1,340
32	1/2	yes	85 msec	5 Mbits/s	\$ 995	\$ 795
32	Full	no	30 msec	5 Mbits/s	\$ 1,775	\$ 1,575
65	Full	no	30 msec	5 Mbits/s	\$ 2,295	\$ 2,070
100	Full	yes	18 msec	10 Mbits/s	\$ 4,995	\$ 4,995

Removable Hard Disk

10	1/2	no	90 msec	5 Mbits/s	\$ 1,095	N/A
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Tape Systems and Subsystems

Formatted Storage Capacity	Height	Data Transfer Rate (k/sec)	PC or PC/XT	AT
60 Mbytes	1/2	88	\$ 995	\$ 995
60 Mbytes Subsystem		88	\$ 1,295	\$ 1,295
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COBOL, a popular mainstay of business communications, is no longer limited to mainframe territory: New programs, like VS COBOL Workbench, bring the mainframe language to the PC.

WORKBENCH: A Program That Means Business

After quietly evolving as a mainframe language for more than two decades, COBOL is suddenly attracting attention in the PC world. Several factors have sparked this recent interest. First is its overwhelming popularity: Easy readability and comprehensive data manipulation have made COBOL the universal computer language of business, which in turn has led managers to consider it for PC work. Second is its newfound availability: A number of PC software vendors have recently produced COBOL compilers that closely resemble their mainframe kin. Having sophisticated COBOL systems on the PC allows companies to off-load program development from their often overworked mainframes.

One system designed particularly for PC use is *VS COBOL Workbench* from Micro Focus. Before surveying its features, let's take a brief look at the VS COBOL language.

The COBOL Language

Most mainframe applications are written in COBOL. Unfortunately, several different COBOL syntax standards are in use today. Micro Focus—a victim as well as, perhaps, a perpetrator of the resulting confusion—based *Workbench* on the ANSI X3.23-1974 syntax, generally acknowl-

edged as the primary language reference. Micro Focus then extended that syntax to include elements from the IBM OS/VS COBOL 2.3 compiler, IBM VS COBOL II (1984) compiler, and the proposed 1985 ANSI revisions to its own standard. Finally, MF added a healthy dollop of its own PC-oriented language extensions.

The resulting potpourri is decidedly busy—so much so that a few caveats are in order. Mainly, if you're writing a program that you'll eventually use on a mainframe computer, be careful to use only those *Workbench* language elements that are also supported by the mainframe's compiler, or you might feed it some code it can't digest. While this precaution is necessary, it's frustrating to be exposed to Micro Focus language goodies that you cannot subsequently use on your mainframe computer. However, you can specify the particular language subset that most closely matches your mainframe compiler. Moreover, the overlapping syntax structures make the reference manual large and somewhat confusing.

The Workbench Environment

Packaged on three system disks, *VS COBOL Workbench* comes with a user's manual and a language reference manual. The first two disks contain the *Workbench* software itself, while the third disk contains a number of sample subprograms and the help library. You can run the system using only floppy disk drives, but a hard disk is faster and more convenient. Once you make the customary backup copies,

you type in "COBOL" to invoke the command menu. This menu guides you through each step of the program development process, using function keys 1 through 8 for such major functions as editing, checking, and compiling. You select the work you wish to do by pressing the appropriate PF keys, either by themselves or in conjunction with the Alt or Ctrl keys. If you find yourself confused along the way, the handy F1 key summons a help screen to put you back on track.

The first *Workbench* component you're likely to encounter is the editor (F2 on the command menu). Most of the features you expect from a modern program editor are included. You can perform block moves as well as copy, find, and replace (although the mechanism is unwieldy), and do line splitting or joining. Obvious omissions are line numbering and split-screen processing. From the mainframe's point of view, the most damning criticism of this editor is that it doesn't resemble the popular SPF (Structured Programming Facility) editors that are most commonly used on the big IBM OS machines. Now that both TSO and CMS (the two predominant on-line monitors) support SPF editors, Micro Focus could gain an important marketing edge by recasting its editor into a more familiar mold. No one likes to learn a new editor.

After editing, you can use the *Workbench* syntax checker to search for any language errors you may have committed during the coding phase. One of its unique features lets you—with a touch of a key—

move directly to the line where an error is found, correct it, then restart the checking process. Once it finishes checking, the syntax checker will produce intermediate-level code. You can either test this code us-

ing Animator and/or compile it into machine code.

Animator is a very powerful debugging facility that monitors the execution of your program. You can watch each line of Pro-

cedure Division code light up as it executes at a selected speed, or ZOOM through the entire program without visual display. You can set various levels of breakpoints throughout the program, monitor and change the contents of data items, and trace execution through any number of called subprograms. This *Workbench* feature provides an extremely efficient mechanism for program checkout, and it's fun to use, too. The time you invest in learning its extensive array of options will be repaid many times over in quickly debugged COBOL programs that you can feel confident about.

At this point in the development process, you would either upload your source code to the mainframe or compile the checked intermediate code for subsequent execution on the PC. The compiler produces machine language code that is executed by the *Workbench* Run facility. The Run facility can also execute checked, uncompiled code, but the rate of execution will be slower than that for compiler output. On the other hand, uncompiled code is more space efficient—better evaluate your space-versus-speed needs before deciding whether or not to compile.

If you're going to distribute your PC programs to a user group, you'll probably want to create standalone executable code that doesn't require the *Workbench* Run facility. To this end, Micro Focus has included a Build facility that creates standard .COM files from your compiler output, ready to be transported to other PCs for execution. If your file, when built, is over 64K bytes, you'll have to invoke *Workbench's* COM2EXE utility to convert it to an .EXE file—a DOS requirement.

One other feature of *Workbench* is worth mentioning: the Session Recorder,



VS COBOL Workbench

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Major COBOL Elements

Here are the major COBOL elements, as implemented on *Workbench*, that extend beyond plain vanilla COBOL. The Identification Division contained no sur-

Easy readability and comprehensive data manipulation have made COBOL the universal computer language of business, which in turn has led managers to consider it for PC work.

prises. In the Environment Division, you can specify the ASCII or EBCDIC character set as well as the collating sequence. This is important to IBM mainframers, where EBCDIC is standard. If you use the wrong collating sequence, your COBOL sorts will give you unexpected results. *Workbench* supports four different file organizations via SELECT statements for sequential, line-sequential (text), relative, and indexed (ISAM) files. *Workbench* does not support direct files. If you're concerned about VSAM compatibility, relax—you can use the ISAM syntax to name primary and alternate record keys and to specify a File Status data item. Of course, you don't actually get VSAM processing with *Workbench*, just ISAM. One nice extension for PC use is a LOCK clause that allows you to specify exclusive or shared usage of files in a multiuser environment.

You get good flexibility in associating internal filenames with external ones. Files can be assigned to an external file reference (DDNAME in IBM mainframe language), to a literal such as B:MYFIL.COB, or to a data item containing a valid filename. This last method allows you to

specify dynamic file assignment at run times by changing the value within the data item.

Within the Data Division, you can specify any internal data format, as long as

it's display, binary (Comp), or packed decimal (Comp-3). Floating-point representation is absent. Synchronizing data items presents an interesting problem. The IBM PC is a byte-aligned machine, so that

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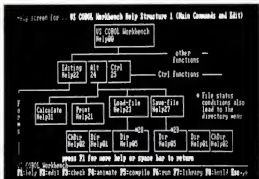
VS COBOL WORKBENCH

the default synchronization is at the byte level—which is really no synchronization at all. You can specify (via the syntax checker) 2-, 4-, or 8-byte word alignment, allowing bit padding to match your main-

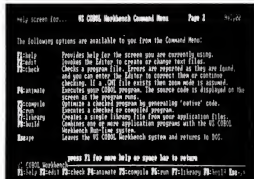
frame counterpart. You would choose 4-byte alignment for IBM computers.

For some reason, Micro Focus has included a Communications Section while omitting the Report Section. However, the

Report Writer facility supported by the Report Section is widely used on mainframe computers, since it provides a highly structured mechanism for report generation. However, it would have been better to



Workbench provides a visually structured help menu.



The main menu choices for VS COBOL Workbench.

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VS COBOL WORKBENCH

drop Communications, which is seldom used, and implement Report Writer. The usual syntax for FDs, SDs, Working-Storage, and Linkage Section is present. Unlike mainframe COBOL, most of the clauses in the File Section are for documentation only.

Workbench comes with a full set of Procedure Division verbs, including complete SORT/MERGE syntax, table handling, and ANSI COBOL debugging. Furthermore, enhancements in the Procedure Division abound. Perhaps the most significant enhancement is the inclusion of explicit scope delimiters such as END-ADD, END-IF, and so on. COBOL programmers have been clamoring for such delimiters from the beginning, and their inclusion is a welcome aid to structured technique. Another interesting addition is that of negated exceptions such as NOT ON SIZE ERROR and NOT AT END, which can be useful in isolating conditions that fail to occur.

You'll also welcome the provision for nested COPY statements, which conveniently let you include COPY commands within your COPY libraries. *Workbench* has a comprehensive Library facility in which you can store not only source code copylibs, but also subprograms, segment overlays, and executable programs.

Three new verbs have been added courtesy of the IBM VS COBOL II standard. The first, CONTINUE, is a no-operation statement. It has no effect on the program but is useful when coding conditional statements before you know exactly what the associated imperative is. For example, to balance an IF..THEN..ELSE construct, you could include a CONTINUE verb instead of the usual NEXT SENTENCE clause. This would serve as a reminder to replace the CONTINUE verb with some imperative later on. Also, CONTINUE can be used following the AT END clause, whereas NEXT SENTENCE cannot.

EVALUATE, a rather complex new verb, allows you to compare the subject(s) being evaluated with one or more objects. The subjects and objects can be data items, literals, expressions, or the keywords TRUE, FALSE, or ANY. WHEN phrases offset each group of objects, which are compared sequentially with the corresponding subjects. If all conditions within

the evaluation are true, then the imperative statement associated with that particular WHEN phrase is executed. If no WHEN phrase satisfies the evaluation, control

If you are buying
Workbench solely to
support a mainframe
environment, remember
that part of the hefty
purchase price is going
toward a Forms facility
that you'll never use.

passes to the WHEN OTHER phrase, if present, or to the next sequential instruction. EVALUATE should prove especially useful whenever a program has to detect one or more complex states that consist of

a series of conditions, then take some action appropriate to that state.

The third new verb is INITIALIZE. INITIALIZE sets a list of data items that you specify to zeros or spaces, depending on class. Furthermore, you can override the default values with the REPLACING option. Very neat.

ACCEPT and DISPLAY

One set of language extensions deserves special discussion. *Workbench* enhanced the ACCEPT and DISPLAY verbs to process full-screen images on the IBM PC. You create these images with the *Workbench* Forms facility. Essentially a screen painter, Forms allows you to draw literal and variable data fields upon the display screen, which *Workbench* converts into standard COBOL data descriptions. It then places these descriptions into a COPY library and the appropriate COPY statement into your program. You also get a

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VS COBOL WORKBENCH

second copylib member containing Procedure Division code to ACCEPT and DISPLAY the screen. You can even request Forms to generate an entire program that will store data from your screen onto an indexed file, using the ACCEPT and DISPLAY verbs.

The Forms facility is a mixed blessing. In practice, it works quite well on the PC. However, bear in mind that the attribute bytes and other features of the COBOL screen descriptions are optimized for the IBM PC hardware. The output from Forms could never be used in a mainframe environment, where display screens can have very different hardware characteristics and where the ACCEPT/DISPLAY extended syntax is unrecognized. If you are buying *Workbench* solely to support a mainframe environment, remember that part of the hefty purchase price is going toward a sophisticated Forms facility that you'll never use.

Evaluation

There is no doubt that *VS COBOL Workbench* is first-class software. It performs its tasks quite well, is reasonably easy to use, and is well documented. At \$4,000 a copy, it's also expensive. Is it worth it? The answer depends upon a number of variables, of which the most important may be whether you're writing applications for PCs or for mainframes. Let's look at the mainframe perspective first.

Some of *Workbench*'s flaws as a development tool for mainframe applications have already been mentioned. The language comes in various syntax sets, none of which may exactly match that of your primary compiler. Moreover, Report Writer is not supported, the editor is dissimilar to its mainframe counterparts, and the sophisticated Forms facility is usable only on PCs.

None of these problems is severe enough to be decisive. Rather, at the outset, a prospective buyer must consider questions that pertain to his own situation. First, is there a need to offload the COBOL development process from the big machine? There are many computers out there functioning nowhere near capacity. Instead of investing in a PC COBOL compiler (not to mention PC hardware!), a programming director could purchase one of

What to do after you've tried banging on the PC and yelling 'I know you're in there.'

the many excellent on-line COBOL development systems available for mainframes today. These systems provide enhanced coding and debugging facilities.

Another important factor influencing

There is no doubt that
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But at \$4,000 a copy, it's
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the purchasing decision is the extent to which you use other systems, such as CICS and DL/I, together with mainframe COBOL applications. Typically, these other systems have their own syntaxes, which must be embedded in the COBOL program. The program is then precompiled by a language translator, thereby converting the foreign syntax into standard COBOL CALLS. These activities are well beyond the scope of *Workbench*.

It is theoretically possible to program all but the foreign code using *Workbench*, syntax check and debug it, upload it to the mainframe, add the missing code, recompile it, and then test. Besides being unwieldy, this scheme denies the central fact that the embedded systems are fundamental to the functioning of the program. To test without them is essentially useless.

Last, IBM's XT-370 personal computer is an excellent tool for off-loading work from the mainframe. Though the cost of this machine is higher than that of a plain PC, the efficiencies of not having to purchase or learn new software tools and editors makes this an attractive alternative.

So, which mainframe sites should consider the purchase of Micro Focus *Workbench*? If you are using your big machine at or near capacity and can't afford to increase capacity further, if you can spring for (or already own) PCs but not the 370 PC, and if you don't use Report Writer or COBOL-embedded software products, then *Workbench* might be appropriate.

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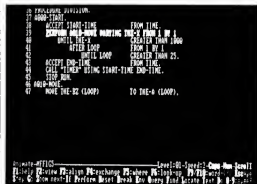
VS COBOL WORKBENCH

you consider *Workbench* from the PC-only point of view. In this situation, *Workbench* can help you produce well-tested COBOL programs that exploit the hardware resources of the PC. The Forms facility is es-

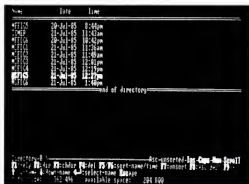
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Eric Bank is an independent data processing consultant based in Manhattan.



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Programs that will restore your files after an inopportune deletion are a great success. It's often very relieving to see a file you thought was gone forever miraculously restored to life. There are some files, though, that you want to make sure no one can resurrect. For example, you may be in charge of some sensitive information such as a payroll, class grades, some secret new program, or even a particularly piquant diary. Once through with such files, you don't want just to put them in a waste basket; you want to run them through an electronic paper shredder.

This problem of security arises because when a file is deleted, the actual data on the disk isn't touched at all. The only data deleted is that which DOS uses to keep track of the file. Undeleting programs can re-

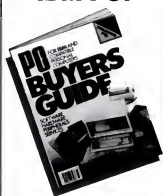
1985/No. 21

structure your disk so that that information is restored in a straightforward way. On the other hand, if you write over the file before deleting it, no amount of undeleting can bring it back.

That's what the program presented in this column does. Admittedly, you could write your own program to write over a specific file and then delete it. But it's cumbersome to have always to search out a standalone program. For convenience's sake, it's better simply to modify DOS's DEL command so that wherever you are, you have the option of overwriting or not overwriting before deleting.

DELZ.COM does just this. Once you

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```

10 FOR I = 1 TO 657:READ BYTE:TOTAL%=TOTAL%+BYTE:NEXT I:RESTORE
20 IF TOTAL%<=$1111 THEN PRINT "Error in data.":END
30 OPEN "DELZ.COM" AS #1 LEN = 1 'Open DELZ.COM
40 PRINT "CREATING DELZ.COM"
50 FIELD #1,1 AS BYTE.%
60 FOR N = 1 TO 657
70 READ BYTE.%
80 LSET BYTE.% = CHR$(BYTE.%)
90 PUT #1
100 NEXT N
110 CLOSE #1
120 PRINT "DELZ.COM CREATED."
130 END
140 DATA 233, 82, 2, 48, 67, 41, 49, 57, 56, 53
150 DATA 32, 83, 32, 72, 111, 188, 122, 110, 181, 114
160 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8, 8
170 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8, 8
180 DATA 8, 8, 8, 68, 69, 76, 47, 98, 8, 13
190 DATA 18, 36, 32, 98, 69, 82, 79, 69, 68, 32
200 DATA 65, 78, 68, 32, 68, 69, 76, 69, 84, 69
210 DATA 68, 46, 13, 18, 36, 69, 114, 114, 114, 114
220 DATA 32, 188, 181, 188, 181, 116, 185, 118, 183, 32
230 DATA 36, 156, 128, 252, 19, 117, 16, 46, 128, 62
240 DATA 21, 1, 1, 117, 8, 46, 246, 6, 28, 1

```

(Figure 1 continues)

Figure 1: The BASIC program to generate DELZ.COM.

PROGRAMMING/UTILITIES

250	DATA	1,	116,	6,	157,	46,	255,	46,	27,	1,	83
260	DATA	81,	82,	86,	87,	80,	46,	137,	22,	37,	1
270	DATA	46,	140,	30,	39,	1,	180,	47,	205,	33,	46
280	DATA	137,	30,	23,	1,	46,	140,	6,	25,	1,	30
290	DATA	180,	26,	186,	128,	0,	14,	31,	205,	33,	31
300	DATA	46,	139,	22,	37,	1,	180,	17,	205,	33,	168
310	DATA	1,	116,	6,	88,	176,	255,	233,	164,	0,	190
320	DATA	129,	0,	191,	192,	0,	185,	11,	0,	30,	14
330	DATA	31,	186,	128,	0,	180,	15,	205,	33,	60,	0
340	DATA	117,	105,	187,	128,	0,	199,	71,	14,	0,	2
350	DATA	139,	71,	16,	51,	210,	169,	255,	1,	116,	1
360	DATA	66,	177,	9,	211,	232,	46,	163,	35,	1,	46
370	DATA	1,	22,	35,	1,	139,	71,	18,	177,	7,	211
380	DATA	224,	46,	1,	6,	35,	1,	186,	128,	0,	46
390	DATA	139,	14,	35,	1,	180,	21,	205,	33,	60,	0
400	DATA	117,	45,	226,	248,	180,	16,	205,	33,	60,	0
410	DATA	117,	35,	180,	19,	46,	198,	6,	20,	1,	1
420	DATA	205,	33,	46,	198,	6,	20,	1,	0,	60,	0
430	DATA	117,	15,	232,	75,	0,	46,	141,	22,	52,	1
440	DATA	180,	9,	205,	33,	235,	17,	144,	180,	16,	205
450	DATA	33,	46,	141,	22,	75,	1,	180,	9,	205,	33
460	DATA	232,	47,	0,	31,	46,	139,	22,	37,	1,	180
470	DATA	18,	205,	33,	168,	1,	117,	3,	233,	95,	255
480	DATA	88,	176,	0,	30,	80,	180,	26,	46,	139,	22
490	DATA	25,	1,	142,	218,	46,	139,	22,	23,	1,	205
500	DATA	33,	88,	31,	95,	94,	90,	89,	91,	157,	207
510	DATA	187,	129,	0,	180,	2,	185,	11,	0,	138,	23
520	DATA	205,	33,	67,	226,	249,	195,	80,	83,	81,	82
530	DATA	87,	86,	30,	156,	46,	255,	30,	31,	1,	187
540	DATA	64,	0,	142,	219,	139,	30,	28,	0,	59,	30
550	DATA	26,	0,	117,	3,	233,	172,	0,	131,	235,	2
560	DATA	131,	251,	30,	115,	6,	187,	62,	0,	131,	235
570	DATA	2,	139,	23,	128,	250,	90,	118,	3,	128,	234
580	DATA	32,	14,	31,	128,	62,	22,	1,	1,	117,	16
590	DATA	198,	6,	22,	1,	0,	198,	6,	21,	1,	0
600	DATA	199,	6,	41,	1,	0,	0,	141,	54,	43,	1
610	DATA	3,	54,	41,	1,	58,	20,	117,	95,	255,	6
620	DATA	41,	1,	128,	250,	47,	117,	31,	185,	64,	0
630	DATA	142,	217,	137,	30,	28,	0,	180,	10,	185,	1
640	DATA	0,	138,	194,	51,	219,	205,	16,	180,	3,	205
650	DATA	16,	131,	194,	1,	180,	2,	205,	16,	128,	250
660	DATA	90,	117,	31,	185,	64,	0,	142,	217,	137,	30
670	DATA	28,	0,	180,	10,	185,	1,	0,	138,	194,	51
680	DATA	219,	205,	16,	180,	3,	205,	16,	131,	194,	1
690	DATA	180,	2,	205,	16,	14,	31,	128,	124,	1,	0
700	DATA	117,	11,	198,	6,	21,	1,	1,	199,	6,	41
710	DATA	1,	0,	0,	198,	6,	22,	1,	0,	129,	250

(Figure 1 continues)


```

720 DATA 13, 28, 117, 5, 198, 6, 22, 1, 1, 31
730 DATA 94, 95, 90, 89, 91, 88, 207, 184, 0, 0
740 DATA 142, 216, 161, 36, 0, 46, 163, 31, 1, 161
750 DATA 38, 0, 46, 163, 33, 1, 199, 6, 36, 0
760 DATA 130, 2, 140, 14, 38, 0, 161, 132, 0, 46
770 DATA 163, 27, 1, 161, 134, 0, 46, 163, 29, 1
780 DATA 140, 14, 134, 0, 199, 6, 132, 0, 91, 1
790 DATA 14, 31, 186, 85, 3, 205, 39

```

(Figure 1 ends)

run DELZ.COM, it will attach itself in memory. From then on, if you type DELZ BASEBALL.BAT, BASEBALL.BAT will be zeroed before deleting (and a message will appear telling you so). If you just type DEL BASEBALL.BAT, the file is simply deleted, as it would have been before. In effect, DELZ.COM adds another option (the /Z option) to the DEL command. (Please note that ERASE/Z will not work.)

To get your own copy of DELZ.COM, just type in the BASIC program shown in Figure 1, or download it via modem from PC Magazine's Interactive Reader Service at (212) 696-0360. When run, it will produce DELZ.COM. [A full .ASM source listing plus an already assembled DELZ.COM file is also available through PC-IRS. If you want the assembler listing and don't have a modem, you can obtain it by sending a self-addressed stamped envelope request to: Technical Editor, PC Magazine, One Park Ave., New York, NY 10016.—Ed.] To use the program, just type DELZ, and you're set until you reboot. It is worth noting that DELZ does not actually modify the internal DOS DEL command at all. Rather, it provides a number of "filters," screening the input and calling certain subprograms to get the job done.

How It Works

When you run DELZ.COM, it attaches itself inside memory. From there it is able to read whatever you type. If it sees the DELZ command given, it will know that the file to be deleted should be zeroed too.

Actually, to save space, DELZ does not fill the file that it is deleting specifically with zeros. To do so, it would need a large block of zeros stored in memory that could be used in writing over the file, and that

block would take up memory space. In fact, whenever it is "zeroing" a file, it is really just writing copies of itself into the file. Since this overwrites the file, it is as effective as zeros and saves memory space as well. (You might use an undeleting program to see this happen.)

The process of monitoring what you type isn't as hard as it may sound. Whenever you strike a key, a signal is sent to interrupt whatever program is running so that the key can be read in. This signal is called a hardware interrupt. Whenever one occurs, a special program designed for it is run; in this case, that program is designed to read in the just-struck key.

DELZ simply substitutes its own address in place of the one normally run. Thus, whenever keys are struck, DELZ can filter them and check to see if DELZ has been typed.

If it has been, this filter part of DELZ sets a flag; that is, it sets a byte in memory to 1. When the file is actually deleted, the second part of DELZ checks to see if this byte is 1. If it is, the file is zeroed before being deleted. If this byte is 0, a normal DEL command is given, and the file is simply deleted normally. Many programs pass information back and forth this way, and, in fact, a specific part of the BIOS is set aside to hold just such flags.

The Deleting Process

On each disk there are two tables that DOS uses to keep track of files. The first is, of course, the directory. The directory stores the file's name, size, date of creation, where it starts on the disk and so forth. The second table is the File Allocation Table, which has the appealing acronym of FAT. Each file on the disk is divided up into 1,024-byte sections, and it is the FAT that keeps track of them. For each 1K

byte of space on the disk, there is an entry in the FAT.

When a file is deleted, all its entries in the FAT are cleared and set to 0. Its directory entry is marked as deleted as well. To delete a file, DOS uses its own internal programs. We also have access to these same programs in assembly language.

Zeroing the File

When DOS calls its deleting subprogram, DELZ simply intercepts the call. DOS supplies its subprogram with the name of the file to delete, which may include wildcards (like *.BAS). DELZ reads that name and, using other DOS subprograms, finds the first filename on the disk that matches the one we're supposed to delete.

Once a match is found, DELZ opens the file, using yet another DOS subroutine. When the file is opened, DOS tells DELZ how long the file is, after which DELZ writes copies of itself out to it, 512 bytes at a time, until the file is filled up.

There are two reasons for using 512-byte blocks. First, writing out 512 bytes at a time is relatively fast—certainly faster than using, say, 128 bytes, BASIC's typical record size. The second reason is that the disk itself is cut into 512-byte sections named sectors. Two of these sectors make up a "cluster," which is what the FAT keeps track of. Since each file takes up an integral number of sectors, writing out one sector at a time cannot possibly write past the end of the file.

By filling every sector with new contents, DELZ destroys the original file completely. After all the old file's sectors have been overwritten, the file is closed. DELZ then uses the original DOS subprogram to delete the file, and an appropriate message is printed on the screen.

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I gave samples of the diskettes to Curt Rosenstein and, in turn, to Tom Street, both hackers of long experience and members of the Walken (Illinois) Apple Users Group.

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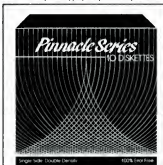
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But, then again, I have the diskette that Tom Street literally met and kept on running.

The truth about \$1.00 or less diskettes.

More and more ads are popping up offering diskettes for \$1.00 or less.

By the same token, more and more people who were selling used cars a few months ago are now selling diskettes by mail.

We did a little survey of current ads for diskettes advertised for a dollar or less and did some analysis of the market and here's what we found as it applies to 5.25" DSD diskettes "supposedly" selling for a dollar or less.

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	99 ea.	102 ea.	Unspecified	
Communications & Electronics	49 ea.	80 ea.	Unspecified	
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Diskette Connection	93 ea.	93 ea.	Unspecified	
Comp Soft Serv	77 ea.	77 ea.	Unspecified	
		+ ship		
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			Wabash	
			Datatech	

The real truth about \$1.00 or less diskettes.

It costs all diskette manufacturers about the same to produce a diskette. Some may charge more because they want to project a "premium quality" image, ala the late, lamented Dysan who bought their basic media from 3M.

Some charge less because they sell a sub-standard product... and we're not foolish enough to name names here.

But here's the truth about the \$1.00 or less diskette market: it falls into four categories.

1. The DISK WORLD! of the universe who simply are so big that they can buy top quality product in massive quantities and choose to pass on the savings to you (Precision Data and Diskette Connection on BRAND NAME products also fall into this category.)

2. The people who buy "cosmetic" stuff from major manufacturers that usually miss quality control standards, but is cosmetically blemished and thus can't be packaged and sold under the manufacturer's own name.

3. "Duplicate Quality" Unidentified media, usually below manufacturer's own standards and frequently below ANSI and IBM standards. Sold on an "as-is" basis with the understanding that the manufacturer's name will never be divulged. Usually about a 20% reject rate, as compared to DISK WORLD's standard of less than 1/1000th of 1% reject/return rate. Next to garbage, this is the source of most diskettes advertised at a dollar or less.

They may work, and then again they may not, (frankly, the odds at the Blackbox label in Las Vegas are more in your favor.)

4. Garbage. Stuff that shouldn't be sold at all. But some manufacturers are hurting for cash, so they sell it anyway.

(After all, they want to meet their payroll. Look what happens when you don't: you become a Dysan or Verbatim. Lots of history, but no money.) More and more garbage is being dumped into the market as manufacturers become pressed for cash and are motivated into selling anything and everything they can manufacture. (Read the article in FORBES about Verbatim and its "Bonus" brand.)

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PROGRAMMING/UTILITIES

How Secure Is Secure?

After a file has been deleted, it can still be undeleted until its directory space is used or, even more securely, until it is physically overwritten on the disk. Programs that undelete typically read in the directory, which occupies certain sectors on the disk, and search for those entries marked as deleted. When one is found, the program then checks to see whether it is the former directory entry of the file we are trying to undelete. If so, the directory entry is unmarked (that is, the file is no longer marked as deleted) and written back to the disk.

From the directory entry, the program can find where the file begins on the disk, that is, which cluster (group of two 512-byte sectors) it uses first. This information is the key to the FAT. Although the file's

By filling every sector with new contents, DELZ destroys the original file completely.

entries in the FAT have been zeroed, we now know where the first one is. From there, typically, the undeleting program will look ahead in the FAT for the next free entry (corresponding to the next free 1K-byte space on the disk) and assume that the file to be undeleted recently occupied that space. Some undeleting programs allow you to type out part of that 1K-byte cluster to check and see if part of your file is really there. Once this next entry in the FAT is determined, it is added into the file. In this way, the FAT is slowly restructured. The last entry in the FAT is filled with a special number to indicate that this is the final cluster used by the file.

Although a file that has been deleted with DELZ can certainly be brought back in this manner, it will have completely different contents. In addition, its length will be a multiple of 512, since it was rewritten in 512-byte blocks. In other words, it can be brought back, but not intact. And that's what you want for a little extra security on the PC.

Steven Holzner is a contributing editor of PC Magazine.

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□ 1971

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Company Profile located on page
a **MUX/VERTER**
Point-to-point, Multipoint □ 16
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line rate □ General common □
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back □ Up to 16 VP inputs/line
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— \$8,000 (16-ch)

a 1150 Series

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composite link □ General common □
Local channel loopback, Remote channel
loopback, Local composite link loopback,
indicators □ Standalone, Rackmount □ 25,
000 channel ends installed □ 1971
Purchase — \$575 (per ch)

SOFTWARE PACKAGE INDEX

WORD PROCESSING, On-Line Software
International pg N-1050
WORD PROCESSING, Philips Information
Systems pg N-1058
WORD PROCESSING, Professional
Business Computer Systems pg N-1060
WORD PROCESSING, RCA Service Data
Services Division pg N-1064
WORD PROCESSING, SBS Computers
pg N-1074
WORD PROCESSING, Solvation pg N-896
WORD PROCESSING, State of the Art
pg N-1079
WORD PROCESSING, Status Computer
pg N-1060
WORD PROCESSING, Sydney
Development pg N-1051
WORD PROCESSING, Use Plus pg N-1074
WORD PROCESSING, Westend
Business Systems pg N-706
WORD PROCESSING, ENHANCEMENT,
Informatics General pg N-1063
WORD PROCESSING, IN SPANISH,
Thesis Group pg N-104
WORD PROCESSING, SYSTEM,
Cremenco pg N-1036
WORD PROCESSING, SYSTEM, Model
pg N-1055
WORD PROCESSING-S/23, IBM
pg N-1045
WORD PROCESSING-DATA
CONVERSION, Muller-Mugho
pg N-1040
WORD PROCESSING-ELECTRONIC
TYPEWRITER, Solvus Computer
pg N-1060
WORD PROCESSING, Trans-
national Reporting Trans-
action, Rackmount □ 1,000
ended □ 1983 □ Purchase
\$2,240 (24-ch)

WORDMARC, MA
International pg N
WORDMARC, Pulsar Systems

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SOFTWARE COMPANY PROFILES

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2690 Skokie Valley Rd
Highland Park, IL 60035
312-433-7650
President: Stan Goldberg; VP Marketing:
Susan Goldberg; VP Sales: Evelyn Burg.
VP Research/Dev: Mike Hattak
Sales \$5,000,000; Empl. 60; Est. 1960
Business Areas—Software

MICRO MANUFACTURING SYSTEMS

2600 Corporate Exchange Dr
Columbus, OH 43229
614-895-0738
President: Larry J. Fox; VP Marketing:
Gregory A. Miller
Sales \$1,200,000; Empl. 12; Est. 1977
Business Areas—

MICRO MATE

P.O. Box 3695
Reading, PA 19601
215-871-0595
Owner: Harvey M.
Sales \$12,000; Est.
Business Areas—
training

MICRO MED.

5109 Pleasant Ave
Fairfield, OH 45017
513-286-7796
President: Kim Olen
Empl. 14; Est. 1977
Business Areas—
Programming, Con-
Distributor, Ed and
Sys. analysis

MICRO PERIPHERALS, (MPI)

9754 Deering Ave
Chatsworth, CA 91311
213-709-4332; Tlx: 910-494
CEO: Ralph Gabai; President:
Campbell, VP Marketing/Sale
Kronic
Sales \$60,000,000; Empl. 1,
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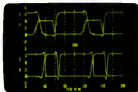
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MICROCAP is an interactive analog circuit drawing and simulation system. It allows you to sketch a circuit diagram right on the CRT screen, then run an AC, DC, or Transient analysis. While providing you with libraries for defined models of bipolar and MOS devices, Opamps, transformers, diodes, and much more, MICROCAP also includes features not even found in SPICE.

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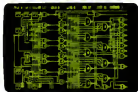


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Spreadsheet Clinic

This forum offers our readers an opportunity to exchange the quick fixes, simple solutions, and fancy footwork they've developed to make their spreadsheets work better.

Word Processing with 1-2-3

With one small macro that uses the /Range Format command, you can turn 1-2-3 into a fairly workable word processor.

First, set the column width of A to 6 (or whatever you want your left margin to be). Set the column width of B to 60 (or however many characters you want in a line of text). Then, off out of the way, in column D or E, type the macro

```
'(?)~"/tj"~[end][down]/xg/w"
```

Name this macro \W, put the cursor in column B, hit Alt-W, and off you go.

Type text until you have finished a paragraph and hit Enter. Your paragraph will format itself nicely inside column B. If you type more than 240 characters, 1-2-3 will beep, and you will have to hit Enter even if you're not at the end of a paragraph. Just hit the edit key (F2) and keep on going until you finish the paragraph. Hit Enter again. Your paragraph will look fine. Hit the Down-arrow key once or twice to bring a new paragraph. Warning: If you type only one line of text and hit Enter, you will suddenly find yourself at the bottom of the worksheet. End-Up-arrow will get you back.

While you are typing, you can use all of 1-2-3's Edit Mode commands. You can also back up to a paragraph you wrote earlier, hit the edit key, make changes, and hit Enter when you're finished. Your text will even automatically realign itself to reflect the changes.

For typing address blocks, dates, titles, and so on, use the " or ~ label prefixes to right-justify or center text. When you begin a paragraph with a number, be sure to

start with ' so that 1-2-3 will know it's a label. Also, all the normal 1-2-3 commands are still available to you. You can Move, Copy, Erase, alphabetize, and include spreadsheet data in your text. Just be sure to hit Ctrl-Break to get out of the macro before you use any / commands.

When you are finished with your text, print columns A and B or write a macro that prints as much of your worksheet as necessary.

Richard Lee
Elk Grove, California

This little word processor is surprisingly powerful. What's more, it can do something a lot of high-priced word processors can't: multiple columns. If you reset column B's width to 25 or 30, you'll get a nice, skinny column of text. Use the /Move command to rearrange it on the page to suit your liking.

I don't want to suddenly find myself at row 2048 just because I had a one-line paragraph. Therefore, I put an IF statement (/xi) in the macro, as shown in Figure 1. With this modification it does an [end][down] routine only when there are two or more lines in a paragraph. You get some unwanted flash and boom each time the macro executes, but this way you'll never end up staring at a blank screen.

Many Happy Returns

When you use 1-2-3 or Symphony, there is an easy way to look at any part of a large spreadsheet and then return to exactly where you were before. The trick is to hit the + key in Ready mode to make the program think you are going to enter a formula.

You can then page around and look at whatever you like. When you're done, just hit Escape and you'll be right back where you started. Hit Escape again and the + sign will disappear from the command line, and leave the original cell entry unchanged.

This technique also works when you're entering a real formula; it's designed to let you look around for any cell addresses you might need to put into a formula. To get back to the original cell, hit Escape only once. If you hit it again, you'll wipe out your formula.

Scott Tucker
Bloomfield, Connecticut

Tracking Down Circular Errors

I've found a different way to track down circular errors in 1-2-3 from the one described in your July 9 column (Volume 4 Number 14).

As soon as you see the CIRC error message, save your worksheet. Next, hit F9 to recalculate. Then put the cursor in cell A1 and use the /File Combine Subtract command to read in the version you just saved. Most of the cells in your sheet should now have the value zero. Only those that changed value when you last recalculated the worksheet will have any other value. These are your circular references, along with any cells whose values depend on them. They stick out like the proverbial sore thumb.

Stephen P. Johnson
Des Moines, Iowa

If many formulas in your worksheet depend on the value produced by the circular error, you'll have many nanzero cells after the /File Combine Subtract operation. Still, you should have little trouble tracking down the culprit. Thanks for a very clever idea.

```
\W (?)~"/tj"~[end][down]/xi@count(TEMP)>2~[end][down]/xg/w"
```

Figure 1: A revised macro that will not send you to the bottom of the worksheet.

SPREADSHEET CLINIC

Getting Rid of Unwanted Zeros

Many people use 1-2-3 to print invoices and other tabular data. Figure 2 is a typical sample, in which the only calculations are #Units \times Cost = Total, and an @sum of the Total column to give a grand total.

The usual way to set up such an invoice would be to leave out the numbers in the #Units and Cost columns, and to fill the Total column with #Units \times Cost formulas, such as +B5*D5. Until the numbers are filled in for #Units and Cost, the Total column contains a string of zeros. Unfortunately, even after you have completed the invoice, you will still have zeros left in those rows for which there are no #Units or Costs figures (rows 9 through 15 in Figure 2). This makes for unprofessional-looking invoices.

If you use the two-line macro shown in Figure 2, you'll never have those unwanted zeros again. Also, you need only one #Units \times Cost formula (+B5*D5), in cell F5. Just fill in the #Units and Cost numbers in the invoice and run the macro with Alt C. The first line copies the formula in F5 to the entire Total column. The second does a /Data Query according to the ranges described in column H and eliminates all figures in the Total column that are equal to \$0.00. The result: Clean invoices with no zeroes.

Jeff Chamberlain
Wausau, Wisconsin

Driving Color Printers with 1-2-3

If you have one of the new color printers (the Epson JX series, for example), you will find that 1-2-3's Printgraph program can't drive it. *Symphony*, however, which was released later than 1-2-3, can drive far more printers. As it happens, *Symphony*'s PGRAPH.EXE is virtually identical to 1-2-3's GRAPH.EXE. Thus, to get around 1-2-3's limitation, you can set up a *Symphony* Printgraph disk that will print 1-2-3 files on the printer of your choice.

Using *Symphony*'s install program, establish a *Symphony* device driver set that includes the graphics printer you want to use. Copy that device driver set onto a copy of the *Symphony* Printgraph disk and you have a utility that will print 1-2-3 graphs. If you want, you can even run this disk from 1-2-3's Lotus Access system. Just copy LOTUS.COM, LTSLOAD

A	B	C	D	E	F	G	H
4	#UNITS		COST		TOTAL		CRITERION RANGE
5	10		\$25.00		\$250.00		
6	5		\$5.00		\$25.00		TOTAL
7	6		\$7.00		\$42.00		\$0.00
8	30		\$15.00		\$450.00		
9					\$0.00		
10					\$0.00		
11					\$0.00		RANGES
12					\$0.00		
13					\$0.00		TOTAL = F5..F15
14					\$0.00		INPUT = F4..F15
15					\$0.00		CRIT = H6..H7
16					\$0.00		
17							
			GRAND TOTAL		\$767.00		
\C /C5"TOTAL" /DQInput"Crit"DDQ					'Copy +B5*D5 to TOTAL column 'Delete data records that match \$0.00		

Figure 2: An invoice with unwanted zeros and the macro that eliminates them.

.COM, and the 1-2-3 driver set (TD.DRV, GD.DRV, KB.DRV, and PR.DRV) onto your new Printgraph disk. Then rename all three PGRAPH.* files to GRAPH.*.

When you first run the disk, you may get a configuration error message. This is because you haven't configured the printgraph disk yet. Just hit Escape. Then, use the Printgraph menu to save your configuration options.

Eduardo Gomez
Al Khobar, Saudi Arabia

This is a nice way to update 1-2-3. If you do plan to run your new Printgraph disk from the Lotus Access system, make sure that the Symphony device driver set you establish in the first step of this procedure is called LOTUS.SET. (Create it that way or rename it afterwards). That is the file the Symphony Printgraph program will look for when it's called from the Lotus Access system. If your device driver set has a different name, or if you have put together several sets to drive several different printers, call the Printgraph program directly from the DOS prompt with GRAPH xxxxx followed by a Return, where xxxxx is the name of the driver set.

Rows to Columns and Vice Versa

Occasionally I have to modify a worksheet by changing the rows into columns or the columns into rows. There are two obvious ways to do this: (1) move or copy each cell to a new location one cell at a time, or (2) with cells containing values, write formula

las to reproduce the values in different cells. Neither way is efficient. I recently discovered a better solution.

Make a copy of your worksheet and put the original away. Start 1-2-3 by typing LOTUS and choose Translate from the Access System menu. Translate your worksheet from WKS to DIF and then translate it back from DIF to WKS. When you make this second translation, you will get a prompt asking whether you want the translation by columns or by rows. Choose row-wise translation, and your original columns will become rows and your rows will become columns!

If you extract a section of the worksheet to translate and the program hangs up, it probably means you have partial range name definitions within the extract. Strip all range names from the extract with the /Range Name Reset command, save the file, and try the translation again. Translation removes range names and cell formats anyway, so you might as well do it yourself to avoid problems.

David S. Blocker
New York, New York

Sure enough, this will turn your columns into rows and your rows into columns. But the procedure does more than remove range names and cell formats; it also turns all formulas into values. Further, it produces a weird sort of mirror image of your original rows and columns. For example, a column that started in cell B4 (2 across and 4 down) will turn into a row that be-

SPREADSHEET CLINIC

gins at D2 (4 across and 2 down). Still, if all you need is to move values and labels around, it sure beats any other method.

A Bug in the Subroutine Call

In your June 25, 1985 column (Volume 4 Number 13), Mr. Nisley writes about a bug in 1-2-3's subroutine call procedure. As he points out, if a macro adds or deletes lines within a worksheet, /xg or /xc commands in macros located below the additions or deletions will no longer work right if they refer to specific cell addresses. The 1-2-3 macro processor doesn't adjust cell addresses within macros when lines or columns are added or subtracted.

One way around the problem is to avoid using subroutine calls and to use named, one-cell ranges instead of specific cell addresses. Unlike cell addresses, range addresses are automatically adjusted when you change the number of columns or

rows. Thus you can get the effect of a subroutine call by using a simple /xg (GOTO) command that switches control to a "subroutine" macro that begins with a named cell. Just tell the macro to branch to that named cell. If you have another named cell immediately after the original GOTO command, you can put another GOTO at the end of the subroutine to return control to the main macro at the proper location. The point is always to use named ranges instead of cell addresses.

You may, of course, end up with a lot of named ranges in your worksheets, but this is the best way to keep your macros immune to changes in the number of columns and rows. This approach is especially helpful during the development phase of a model, when you probably will be adding and deleting many rows and columns.

Like Mr. Nisley, I am partial to keeping my macros out of sight at the bottom of a

worksheet. So long as you use named ranges within macros, you can add or subtract any number of lines without affecting your macro routines.

Francis E. Lapid
Chicago, Illinois

That should solve Mr. Nisley's problem. He can also use the range table macro in this column to keep his named ranges organized.

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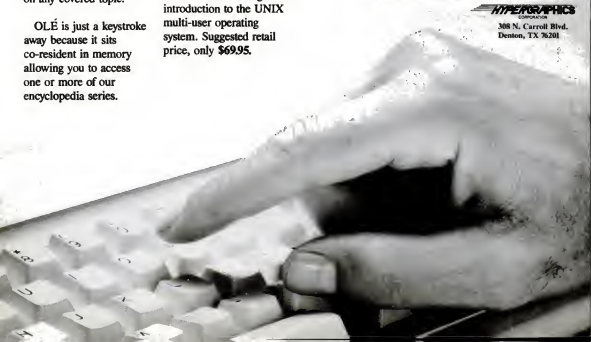
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Power User

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High Memory RAMDisk

Here's the secret for installing 128K additional RAM in the IBM PC and XT, over and above the normal 640K limit. The added memory can be used for a RAM-disk.

The first step is to install 128K RAM in a standard IBM 64/256K Memory Expansion Option board. Set the DIP switches thus:

1 2 3 4 5 6 7 8
OFF OFF ON OFF OFF ON OFF OFF

This configures the board for 128K at segment address D000h and E000h.

Next, you must modify the DOS 2.02.1 RAMdisk program (as you'll see, only a few changes are involved) to use this extra memory rather than normal user RAM. Since a manual reboot will not clear out this memory, I've provided some additional code to retain the contents of the RAMdisk and not reinitialize it if a manual reboot is in progress.

Skip Chambers
Carrollton, Texas

You could almost define a power user as a person who can install a 128K RAM-disk and still have 640K left over.

Although this extra memory space cannot normally be recognized by programs running under DOS, as alternatives to using it for a RAMdisk, you could also use it for a print buffer or as a BLOAD area to hold machine language subroutines under BASIC.

I find this very exciting. Until recently, I have used a 160K RAMdisk, mostly for WordStar. But what with the size of DOS 3.1 and an AUTOEXEC full of remain-resident programs, I gobble up 128K at boot time. In order to run programs requiring 512K, I had to give up my RAMdisk. Now, thanks to Mr. Chambers, I've got one back.

Although the RAMdisk program we'll

be modifying is taken from the DOS 2.x manuals, the changes work both under DOS 2.x and 3.x.

Let's step back a minute to see why this trick is so neat.

The 8088 microprocessor used in the IBM PC and PC-XT can directly address 1,048,576 bytes of memory or 1,024K. But only the first 640K is allocated for random-access (or user) memory. The other 384K is reserved by IBM for other purposes.

At the very top of memory, 64K is allocated for the ROM BIOS and ROM BASIC interpreter. Just above the 640K random-access memory, 128K is reserved for video display memory. While the monochrome display actually requires only 4K and the standard color/graphics display uses only 16K of this 128K reserved area, the IBM Enhanced Graphics Adapter (EGA) lays claim to much more of it.

Following the video display memory is 64K for additional ROMs, such as those containing the BIOS support for the PC-XT hard disk and the EGA.

This still leaves another 128K, which IBM allocated for additional ROM expansion and which is, indeed, the memory area used for PCjr ROM cartridges. But on the PC and PC-XT, this area will normally be free for you to install another random-access memory board, as Chambers proposes. If you have a non-IBM hard disk or other heavy hardware in your system, however, you must check to see if it addresses ROM segments D000h or E000h. If so, you're already using this area, and so you won't be able to install the additional memory described here.

You'll also need a memory board that can be switched to segments D000h and E000h. Some multifunction boards—the popular AST Six-Pack-Plus, for instance—cannot themselves be switched to address an area above 640K. However, if you're up to 640K, you probably already

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have a multifunction board, so a straight memory board such as the IBM 64/256K Memory Expansion Option is ideal.

To install a 128K RAMdisk at this address, you'll also need either the DOS 2.0 or 2.1 Technical Reference manual (the IBM RAMdisk program is to be found at the end of the chapter on device drivers), plus a macro assembler, such as those from IBM or Microsoft.

Type in the "Sample Device Driver" program, calling the file EDISK.ASM. (EDISK stands for "Extra Memory Disk"). Do not type the numbers on the left side of the IBM listing; enter only that part of each line that is even with the top-most semicolon. Further, do not type in any of the lines that have a plus sign just to the left of them (they're toward the end of the listing). These are lines created by the assembler when expanding the macros.

Assemble, link, and convert your EDISK.ASM into a .SYS file by using the following commands:

```
MASM EDISK.;
LINK EDISK;
EXE2BIN EDISK EDISK.SYS
```

Success means getting only one error message from MASM, namely, that there is no stack segment. Ignore it. MASM will also create a file called EDISK.LST. To assure yourself that you typed the program in correctly, check the addresses and assembled machine code at the left of the EDISK.LST listing with the program listing in the DOS manual.

The next step is to include a line in a CONFIG.SYS file in the root directory of your boot disk. This line is

```
DEVICE=EDISK.SYS
```

EDISK will then be loaded at boot time. When first installing a device driver such as EDISK, you should have two different ways to boot your system (such as a disk without EDISK and a disk with EDISK), because if errors in the EDISK program crash your system, you need some way of booting without it.

Unmodified, EDISK.SYS simply creates a 180K RAMdisk on your system in regular user memory. This disk will have a drive letter one above your last normal drive. You may use this disk like any other except that the contents will be destroyed if

the PC is turned off or if you reboot.

Figures 1 through 4 show the changes to make in EDISK.ASM so that it will use the extra random-access memory at segments D000h and E000h. The line numbers are consistent with the line numbers in the DOS 2.0 and 2.1 manuals. Line numbers with decimals, such as 230.1, are insertions; that line would go between line 230 and 231. Otherwise, the lines replace those in the DOS 2.x program.

Figure 1 shows a few changes you should make even if you only want to set up

a normal IBM RAMdisk. These changes take care of the most blatant bugs and allow the program to be assembled under later versions of the IBM or Microsoft Macro Assembler.

Figure 2 shows the changes Mr. Chambers uses to shorten the RAMdisk to 256 sectors and to place it at segment addresses D000h and E000h. Each sector is 512 bytes, so total disk space will be reduced from IBM's 180K to the 128K you have available.

This is really all that's needed, but you

102	USER_DTA	DW	?,?	; CORRECTION
230.1		PUSH	CS	; ADDITION
230.2		POP	DS	; ADDITION
230.3		LES	SI, DWORD PTR RE_OFF	; ADDITION

Figure 1: Changes to make to the PC-DOS 2.x RAMdisk program to eliminate some bugs and assure assembly under later versions of the macro assembler.

92		DW	256	; TOTAL NUMBER OF SECTORS
115		DW	256	; TOTAL NUMBER OF SECTORS
247		MOV	CS:VDISK_PTR, 0D000h	; RAM DISK SEGMENT
248				; DELETE LINE
249				; DELETE LINE

Figure 2: Changes to the PC-DOS 2.x RAMdisk program to use 128K beginning at segment address D000h.

257.1		MOV	CX, 0000h	; NUMBER OF BYTES
257.2		SUB	AX, AX	; BYTE TO WRITE
257.3		REP	STOSW	; 1ST SEGMENT DONE
257.4		MOV	CX, ES	; ES TO NEXT SEGMENT
257.5		ADD	CX, 1000h	
257.6		MOV	ES, CX	
257.7		MOV	CX, 0000h	; NUMBER OF BYTES
257.8		REP	STOSW	; 2ND SEGMENT DONE
257.9		MOV	ES, CS:VDISK_PTR	; BACK TO 1ST SEGMENT

Figure 3: Changes to the PC-DOS 2.x RAMdisk program to initialize 128K beginning at segment D000h to eliminate parity check errors.

255.1		PUSH	DS	; SAVE DS
255.2		MOV	AX, 405	; BIOS DATA SEGMENT
255.3		MOV	DS, AX	; SET UP SEGMENT REGISTER
255.4		CHP	WORD PTR DS:[0728], 1234h	
255.5		POP	DS	; CHECK RESET MODE
255.6		JNE	COLD_START	; INITIALIZE DISK
255.7		JMP	HOT_START	; SKIP IF KEYBOARD RESET
255.8				
290.1		LEA	DX, COLD_MSG	
290.2		JMP	SHORT MESSAGE	
290.3		DB	13, 10, "Hi-RAM disk installed.", 13, 10, "\$"	
290.4		SOT_MSG	DB 13, 10, "Hi-RAM disk preserved.", 13, 10, "\$"	
290.5		HOT_START:	LEA	DX, SOT_MSG ; MESSAGE TO PRINT
290.6		MESSAGE:	PUSH	CS ; CURRENT SEGMENT
290.7			POP	DS ; SET DS TO IT
290.8			MOV	AH, 9 ; DOS PRINT STRING CALL
290.9			INT	21h ; PRINT STRING

Figure 4: Changes to the modified PC-DOS 2.x RAMdisk program so disk contents are preserved on a manual keyboard reboot.

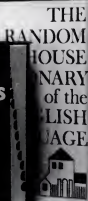
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POWER USER

might be in for a surprise if you read some RAMdisk sectors directly from DEBUG or run the Norton Utilities DISKTEST program on the new RAMdisk. You'll probably get a parity check error, since the odd-ed memory was not properly initialized by the BIOS during boot time. Initialization is easy, however: All you do is write something to it. Figure 3 shows the added steps to initialize the new memory properly.

Finally, Figure D shows the additions Mr. Chambers provides to preserve the disk contents during a "worm boot." Turning on the PC's switch is sometimes called a cold start; resetting the computer with the Ctrl-Alt-Del key sequence represents a hot (or warm) start. The code shown in Figure 4 preserves the contents of the disk when you use a keyboard reset, though they will be lost, of course, if you turn the machine off with the power switch. By the way, you should not study the

RAMdisk program in the DOS 2.x manuals in hopes of learning good assembler programming practice! The listing is excessively macroed and equated to the point where it is virtually unreadable. Moreover, the most important types of equates—those that would allow the user to change the number of sectors or the sector size with one statement at the top of the program—are missing.

Turbo Patches Revisited

We've received several letters from Turbo Pascal users who discovered that the patches shown in Power User Volume 4, Number 16, to get rid of that annoying "Include error messages (Y/N)?" prompt did not work with their particular copy of Turbo Pascal. Fortunately, of course, nobody used their original Turbo diskette to make the patches (right?). The problem is that Turbo Pascal is produced in a variety

of versions: BCD, 8087, generic MS-DOS, and CP/M-86. I checked out the patches on the non-BCD non-8087 PC-DOS versions 2.00B and 3.00B.

Rather than turn PC Magazine into a clearing house for cookbook Turbo Pascal patches, let me simply describe the process by which you can discover for yourself how and where to make your patches. You can then make the changes to get rid of the unwelcome error prompt whatever may be your particular Turbo Pascal version. The technique is an example of the time-honored tradition of "reverse engineering," and it uses only one tool: DEBUG. In the description and listings that follow, the addresses shown are those of Version 3.00B; the addresses you find in your version may differ.

First, load Turbo Pascal thus:

DEBUG TURBO.COM

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and do an R (Registers) command. The value in the CX register (9A80) tells you the number of bytes (hexadecimal) in TURBO.COM. You'll use this value to specify the number of bytes for DEBUG searches.

Next, you search for the offensive text string, with the command:

S 100 L 9A80 "Include error messages"

Note: You don't include the (Y/N) in this string because that may be (and actually is) used with other messages.

DEBUG comes back with

XXXX:2EA0

The value of the XXXX depends on just where DEBUG loaded TURBO.COM; the 2EA0 is the address for the beginning of the text string in Version 3.00B. Now do a D (Dump) command a little before this address:

D 2E90

You'll see that a carriage return (0D) and four line feeds (0A) precede the text, so these are probably part of the message. Thus, the message actually begins at 2E9B rather than 2EA0.

Now you must determine the part of the Turbo program that actually uses this message. Normally, you would use another search command to try to find an instruction that loaded the address of this string into a register:

S 100 L 9A80 9B 2E

(Note: The two bytes of address 2E9B are reversed in the Search command because the 8086 microprocessor stores high bytes last).

In this case, however, that straightforward procedure doesn't work: obviously TURBO.COM is doing things a little differently. You'll note that before this "In-

clude" message is some other text (just do a D 2E00 to see some of it) followed by a zero, followed by nontext beginning at 2E92. Let's unassemble the code at address 2E92:

U 2E92

What you'll see is a few lines of code with a subroutine call right before the beginning of the text string:

XXXX:2E9B EBC7DB CALL 0A62

An examination of that subroutine will show that it writes text to the screen, beginning at the address after the subroutine call, and returns control to the address following the zero byte that terminates the text string. This 00 byte is at 2EB6, so now you can unassemble beginning at 2EB7:

U 2EB7

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POWER USER

```
XXXX:2EB7  EB21B3  CALL  31DB
XXXX:2EBA  A248B3  MOV   [B34B],AL
XXXX:2EBD  74B3    JS     2BC2
XXXX:2EBF  B8FA0D  CALL  3CBC
XXXX:2EC2  B8B00D  CALL  3C59
```

An examination of the subroutine at 31DB (and nested subroutines) shows that it prints the "(Y/N)?" string, gets an answer from the keyboard, converts it (if necessary) from lower case to upper case, and then checks if it's a "Y" (hex 59) or "N" (hex 46). If neither, it just loops around and waits for correct keyboard input. If it's a "Y" or "N", it prints it to the screen and subtracts hex 46 (equal to "N"), leaving a 00 in register AL (and the Zero flag set) for "N" and a 0Bh in AL for "Y".

When the subroutine returns control to address 2EBA shown above, Turbo stores this byte in memory location 0348 and skips around a subroutine call (CALL 3CBC) for an "N" answer. Obviously, then, the subroutine at 3CBC loads the error messages.

Now you've got it. You don't want to call 31DB (because that will wait for keyboard input); you want to set 0348 with 0Bh (the "Y" answer), and you definitely want to run the subroutine at 3CBC. The patch, then, is

```
-A 2EB7
XXXX:2EB7  MOV  BYTE PTR [B34B],0B
XXXX:2EBC  NOP
XXXX:2EBD  NOP
XXXX:2EBE  NOP
XXXX:2EBF  ; BLANK LINE
```

This is the patch shown in Volume 4, Number 16, for Version 3.00B. Other versions will have a similar patch, except that it will begin at a different address and will store the 0Bh somewhere else. Do a W (Write) command, and TURBO.COM (use a copy, not the master, of course) will be patched. If you yield to the temptation to use DE-BUG's G (Go) command first to run TURBO to see if the patch works, don't then use the W (Write) command when Turbo terminates. Rather, reload TURBO.COM into DE-BUG, make the patch again, and then save it with W (Write).

Zeroing Out Ctrl-Zeros

Ta-Chang Lin's method of using the Alt key to type WordStar's Ctrl-P commands into the find-and-replace routines (User-to-User, PC Magazine, Volume 4 Number

3) has been one of the biggest timesavers for me since WordStar itself.

The technique's usefulness isn't limited to this application alone. It can also be used to find-and-replace the sequences of five or six "@" signs that litter computer searches downloaded from Knowledge Index—at least those downloaded via Uninet.

In WordStar, the 3-digit number for "@" is 128. Using Lin's method, type "QA" to start the find-and-replace process, then repeat the next step six times (and hit Enter when you're all done): hold down the Alt key and type in 128, then release the Alt key and type in a @ sign. Six "@" signs should appear on your screen. Then just hit Enter when you see the "Replace With?" prompt, type in NG at the "Options?" prompt, and hit Enter again. Finally, after WordStar gets rid of all occurrences of six "@" signs, repeat the above instructions for occurrences of five "@" signs.

Martin Davis
Charlottesville, Virginia

This is indeed a handy discovery. I download lots of MCI letters each day, and the left margin is crawling with those "@@@" signs (which are technically nulls, or ASCII 0s). However, there's a much better way to get rid of them. After typing "OA, type in a single Alt-148 (rather than five or six), hit the Enter key when asked what to replace it with, hit NG (and then Enter) at the "Options?" prompt, and then hit any other key (the up arrow is a safe bet). By hitting an extra key after the last Enter, you tell WordStar to make the changes without updating the screen, which makes it blazingly fast. And remember, when entering numbers using the Alt key, use the number pad only.

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User-to-User

Readers share their favorite tricks for getting the most out of DOS, BASIC, and their systems in general.

Painless ANSI

In the User-to-User column in *PC Magazine*, July 9, 1985 (Volume 4 Number 14), Brad Stephenson provides a fix for DOS's CLS command that apparently resets any previously set screen colors. The ANSI-COL.BAS program in Figure 1 provides a different approach to setting screen colors that avoids the CLS problem altogether.

ANSICOL lets you choose from a menu of the available colors. After you've made your selection, exit to DOS via the SYSTEM command to set the new colors. CLS will clear the screen to the colors you've set. Of course this method has slight disadvantages; only eight foreground colors are available with the ANSI device driver, and it is not possible to select border colors. But in any case, it eliminates the need to go searching for a disk file every time you want to clear the screen.

Drew Olbrich
Poughkeepsie, New York

Over the past few months dozens of User-to-User readers have mailed in long, complex formulas that exploit the extended screen and keyboard control of ANSI.SYS. Mr. Olbrich's is interesting because he includes a decent menu and because he uses

SHELL. ANSI makes it possible, on any system using DOS 2.x or higher, to create highly customized key definitions and DOS opening screens and menus.

By now, most users know that the DOS PROMPT command provides an easy way to execute the exceedingly thorny ANSI commands. All you have to do is make sure your CONFIG.SYS file includes the line

DEVICE=path\ANSI.SYS

and have ANSI.SYS on your disk. (If ANSI.SYS is on the root directory, you can omit the 'path' in the above example.) You should have a CONFIG.SYS file on your disk to increase the number of buffers DOS normally gives you, to load such device drivers as ANSI and IBM's VDISK RAM-disk, to tell your system how many files it can open simultaneously, and to do such other tasks as instructing DOS how frequently to check whether you've hit Ctrl-Break. You can create your CONFIG.SYS either with EDLIN, or with a real word processor that writes ASCII files, or with the DOS COPY CON: command.

The problem is that writing and correcting the long ANSI syntax string is maddeningly tedious, with its trickle of dollar signs, left brackets, semicolons, integers, and case-sensitive letters. Just parsing a

```
100 "ANSICOL.BAS -- by Drew Olbrich
110 DEFINT A-Z:SCREEN 0,1,0:WIDTH 40:COLOR 7,0:CLS:LOCATE ,0:KEY OFF
120 FOR F=0 TO 7:FOR B=0 TO 7
130 C=C*1:LOCATE F*3+1,B*3+1:COLOR 0,B:PRINT STRING$(4,223);
140 LOCATE F*3+2,B*3+1:COLOR 0,B:PRINT USING "00";C;
150 LOCATE F*3+3,B*3+1:COLOR 0,B:PRINT STRING$(4,220);NEXT NEXT
160 LOCATE 25,1:COLOR 7,0:PRINT "Enter color combination: (1-64) ";
170 LINE INPUT "A";C:VAL(A$);IF C<1 OR C>64 THEN 160
180 B=(C MOD 8)+1:(C-B)/8:B=B-1:IF B<0 THEN B=8:B=B-F+1
190 F=F+303432363133337:"05"04424641454347
200 X$=MID$(F$,F*2+1,2):Y$=MID$(B$,B*2+1,2)
210 OPEN "ANSICOL.TMP" FOR OUTPUT AS #1
220 PRINT #1,CHR$(27)+"[";X$;";";Y$;"m";
230 CLOSE #1:CLS:DEF SEG:=PEEK(4030):B=PEEK(4031)
240 S$="TYPE ANSICOL.TMP:DEF SEG:POKE 4030,A:POKE 4031,B
250 KILL "ANSICOL.TMP:PRINT "DOS screen colors have been changed."
```

Figure 1: ANSICOL.BAS program to set colors in DOS 2.x or higher. This will work only if ANSI.SYS is on your disk and if your CONFIG.SYS file contains the line DEVICE=ANSI.SYS.

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USER-TO-USER

recalcitrant string to discover why something isn't working can drive you batty. In addition, IBM has recently removed many of the ANSI definitions from its manuals and put them into special technical manuals that most users never see. What DOS needs is an easier way to create such ANSI strings.

The ANSIMAKR.BAS program in Figure 2 is a quick and dirty solution to this problem. It lets you select any combination of commands, colors, cursor positions, etc., and automatically writes the long ANSI string to disk, either by appending the proper PROMPT command to your

AUTOEXEC.BAT file, or simply creating a one-line batch file that you can run while in DOS.

ANSIMAKR lets you do virtually everything ANSI allows, other than redefining keys (grist for a future column) and switching modes. And its cursor-moving abilities are limited to one row or column at a time. It has a modicum of error-trapping built in, but it's not 1-2-3. Things like color selection and different screen displays take up room, and this listing consumes a lot of real estate on the page.

To run the program, copy ANSI.SYS from your DOS disk to your work disk, and

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```
100 * ANSIMAKR.BAS -- by PC Magazine
110 * Important -- Your CONFIG.SYS file must include DEVICE=ANSI.SYS
120 * (or DEVICE=/path/ANSI.SYS) and ANSI.SYS must be on your disk I
130 DEFINT A=0:SCREEN 0:COLOR 7,1:LOCATE ,0:KEY OFF:CLS:LIN=15:PB=1
140 DIM AS(23),TS(23),CS(8),FS(100)
150 DEF PRST$(3)=MID$(STR$(3),2,8)* -- "Q6=CHR$(34):G6=STRING$(60,32)
160 B=0:0=Enter a letter, or hit 'M' for text, or hit 'X' to save and quit"
170 FOR A=1 TO 22:READ AS(A):NEXT FOR A=1 TO 22:READ TS(A):NEXT
180 FOR A=1 TO 8:READ CS(A):NEXT:GOSUB 390
190 *
200 * *** main input ***
210 *
220 IF=INKEY$:IF IS="" THEN 220 ELSE V=ASC(CHR$(ASC(IS) AND 95))-64
230 IF V=24 THEN 650 ELSE IF V=23 THEN 590
240 IF V<1 OR V>22 THEN BEEP:GOTO 220 ELSE GOSUB 280
250 *
260 * *** display entries and remember ANSI sequences in FS()***
270 *
280 IF LEN(TS(V))>PB THEN LIN=LIN+1:PB=1
290 IF LIN<25 THEN 320
300 FOR A=15 TO 23:LOCATE A,1:PRINT G6:HEXT
310 LOCATE 24,1:PRINT STRING$(79,32):LIN=LIN+1
320 LOCATE LIN,PB:PRINT TS(V)+"":PB=PB+LEN(TS(V))+1
330 IF V=22 THEN GOSUB 450
340 IF V<23 AND V<24 THEN FS(E)=FS(A)+V ELSE FS(E)=AS(V)
350 E=E+1:RETURN 220
360 *
370 * *** menu sub ***
380 *
390 FOR A=3 TO 13:LOCATE A,1:PRINT G6:HEXT:LOCATE 1,9:PRINT 06
400 FOR A=1 TO 11:LOCATE A+2,6:PRINT CHR$(A+64):E6:TS(A)
410 LOCATE A+2,45:PRINT CHR$(A+75):06:TS(A+11):HEXT:RETURN
420 *
430 * *** colors sub ***
440 *
450 LOCATE 1,1:PRINT G6:LOCATE 1,23:PRINT "Enter a foreground and background "
460 FOR A=3 TO 13:LOCATE A,1:PRINT G6:HEXT
470 FOR A=1 TO 8:LOCATE A+2,9:PRINT CHR$(A+64):E6:CS(A)+" foreground"
480 LOCATE A+2,49:PRINT CHR$(A+74):E6:CS(A)+" background":HEXT
490 IF=INKEY$:IF IS="" THEN 490 ELSE V=ASC(CHR$(ASC(IS) AND 95))-35
500 IF V<18 OR V>37 AND V<48 OR V>47 THEN BEEP:GOTO 490
510 IF V>37 THEN BAC=V:LOCATE 12,49:PRINT "background "+CS(V-39)
520 IF V<48 THEN FOR=V:LOCATE 12,9:PRINT "foreground "+CS(V-29)
530 IF EACE=0 OR FOR=0 THEN 490 ELSE LOCATE 12,32:PRINT "(Hit any key)"
540 FS(E)=FS(E)+PRST$(FOR)+" "+PRST$(BAC)+"m"
550 IF IS="" THEN 550 ELSE BAC=0:FOR=0:E=E+1:GOSUB 390:RETURN 220
560 *
570 * *** text entry ***
580 *
590 LOCATE 1,1:PRINT G6:LOCATE 1,1:LINE INPUT "Enter text ":AS(V)
600 IF LEN(AS(V))>28 THEN AS(V)=LEFT$(AS(V),28):LOCATE 2,1:PRINT G6
610 LOCATE 1,1:PRINT G6:LOCATE 1,9:PRINT 06:TS(V)=G6+AS(V)+G6:GOSUB 280
620 *
630 * *** and ***
640 *
650 IF E=1 THEN END
660 LOCATE 25,1:PRINT "Hit 'P' for a new PROMPT file or":CHR$(32);
```

(Figure 2 continues)

Figure 2: ANSIMAKR.BAS program that lets you create ANSI strings that you can execute through the 2.x or higher DOS PROMPT command. This will work only if ANSI.SYS is on your disk and if your CONFIG.SYS file contains the line DEVICE=ANSI.SYS.


```

670 PRINT "any other key to add this to your AUTOEXEC.BAT"; J$=INPUT$(1)
680 IF J$<>"P" AND J$<>"D" THEN 710 ELSE LOCATE 25,1:PRINT STRING$(79,32);
690 LOCATE 25,1:INPUT "Enter file name: ";FN$
700 OPEN FN$ FOR OUTPUT AS #1:GOTO 720
710 OPEN "AUTOEXEC.BAT" FOR APPEND AS #1:PRINT #1,STRING$(1,32)
720 PRINT #1,"PROMPT "FOR A=1 TO 8:PRINT #1,PS(A);NEXT:CLOSE:LOCATE 1,1
730 PRINT GS:LOCATE 1,17:PRINT "Hit any key to go to DOS and try the new file!"
740 IF INKEY="" THEN 740 ELSE CLS:SYSTEM
750 "
760 " *** data ***
770 "
780 DATA c,c,e,u,e,i,s,e,l,j,e,i,k,e,i,s,e,i,c,e,i,d,t,d,f,v,w,g,l,b,q,h,p,..."
790 DATA Save cursor position,Restore cursor position,Home cursor
800 DATA Clear screen,Clear line,Move cursor up one,Move cursor down one
810 DATA Move cursor right one,Move cursor left one,Print time,Print date
820 DATA Print # [why would you?],Print version,Print default drive
830 DATA Print >,Print <,>,Print a bar |),PRINT ~,Escape previous character
840 DATA Print path,C=LF (carriage return),Change color
850 DATA "black ","Red ","Green ","Yellow","Blue ","Purple","Cyan ","White "

```

(Figure 2 ends)

be sure your CONFIG.SYS file includes the DEVICE=ANSI.SYS line mentioned above. ANSIMAKR lets you put the time, the date, the version, the path, fancy borders (using the ~ and | characters), your own text messages, all normal-intensity color combinations, and more on-screen in practically any configuration, and shows you what you're doing step-by-step.

When you're finished entering the ANSI commands, you can either hit P and enter a filename (preferably one that ends with a .BAT extension), or hit any other key and have the program append the PROMPT line to your AUTOEXEC.BAT routine. If you don't believe ANSI is complicated, run the program and ask for a few color changes, cursor moves, carriage returns,

paths, and the time, date, and version, and see what the final string looks like.

EDUCATING THE cAPSLOCK KEY

If you've ever forgotten that your CapsLock key is on, then you have probably created phrases like "DEAR sIRS." The only time I encounter the DOS use-the-shift-key-and-get-lower-case-letters feature is when I want an upper-case letter and I've forgotten that the CapsLock is on. So I have to delete, retype, and then recover my train of thought. This is one of those rare cases in which the computer really should have known what I meant.

The CAPSLOCK.BAS BASIC program in Figure 3 creates a .COM file called CAPSLOCK that gives your CapsLock key enough common sense to know when you're thinking in CapsLock Off mode. Anytime you use the shift key with a letter key, the CapsLock turns off. Shifting nonalphabetic keys has no effect on

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```

100 'CAPSLOCK.BAS -- by Todd M. Lewis
110 OPEN "CAPSLOCK.COM" FOR OUTPUT AS #1
120 FOR I=1 TO 121:READ B:PRINT #1,CHR$(B);
130 NEXT:CLOSE #1
140 DATA 235, 69, 144, 144, 114, 97, 109, 251
150 DATA 6, 87, 88, 81, 156, 184, 8, 8
160 DATA 142, 192, 191, 23, 4, 38, 138, 37
170 DATA 246, 196, 3, 116, 32, 228, 96, 68
180 DATA 16, 128, 26, 68, 26, 128, 16, 68
190 DATA 38, 128, 18, 68, 39, 128, 8, 68
200 DATA 44, 128, 18, 68, 51, 121, 6, 128
210 DATA 228, 191, 38, 136, 37, 157, 89, 88
220 DATA 95, 7, 46, 255, 46, 3, 1, 184
230 DATA 8, 8, 142, 192, 191, 36, 8, 38
240 DATA 139, 5, 38, 139, 93, 2, 198, 3
250 DATA 1, 137, 4, 137, 92, 2, 184, 8
260 DATA 8, 142, 192, 148, 219, 258, 191, 36
270 DATA 8, 184, 7, 1, 38, 137, 5, 38
280 DATA 137, 93, 2, 251, 186, 71, 1, 285
290 DATA 39

```

Figure 3: CAPSLOCK.BAS program to create CAPSLOCK.COM program, which automatically turns off CapsLock when you hit the shift key and any letter key.

CapsLock, so you can still get to all the special characters and punctuation marks.

Todd M. Lewis
Chapel Hill, North Carolina

You're right—in the case you describe, the computer should know what you mean, and this does the trick. CAPSLOCK works with word processors such as WordStar, which makes it really useful.

New Dates for Old

Here's a trick to put the current date and time stamp on any of your files. It's another undocumented feature of DOS that was passed on to me by a hacker friend. Create a one-line batch file called STAMP.BAT that contains the single line

COPY %1/B., + %1 >NUL

where the ">NUL" suppresses spurious messages that inclusion of the duplicate target filespec generates. Then just type

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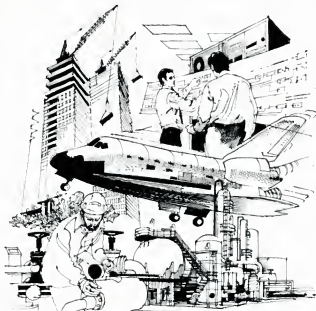
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USER-TO-USER

STAMP filename

substituting the name of the file whose date and time you want to change for "filename" in the above example. Unfortunately, this also suppresses legitimate error messages such as "File not found".

Edward J. Green
Washington, D. C.

Your friend learned this "undocumented" trick by reading the DOS manual. However, your technique includes an improvement over the example in the manual—the addition of a /B that forces DOS to copy the entire length of the file as specified by the directory. If you omit the /B and try this on a binary file with a "Z(CHRS(26))" in it, COPY will stop copying as soon as it hits this character, which DOS assumes is a standard end-of-file marker. The /B will work both for ASCII files (which you can read on your screen by using the TYPE command) and binary files (which will put all sorts of odd characters and beeps on the screen when you try to use the TYPE command). DOS defaults to /B when copying without joining files together but defaults to /A when you ask COPY to concatenate several files.

When DOS concatenates files (using +), it records the current date and time in the directory. If you concatenate source files without naming a result filename, COPY will add all the files it is joining to the end of the first file in the list of filenames to be joined. Since STAMP.BAT uses only one source name, and no result names, the file is concatenated onto itself.

While DOS is strict about punctuation and syntax, your + works as well as the +, that the DOS manual uses. And, as the manual points out, don't restamp all the files on your disk by using *.* in place of the filename. Finally, STAMP.BAT will work fine without the second %1.

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PC Tutor

Do you have a technical question about your PC? PC Tutor answers both elementary and advanced inquiries.

Optimizing PRINT 3.0

Q: Would you please explain the parameter settings B, S, U, and M used in the DOS 3.0 PRINT command? When should you have settings other than the defaults? (I have a PC AT with 640K bytes of RAM.) Also, is it possible to use PRINT with Lotus's 1-2-3, that is, to print in background while continuing to use the spreadsheet actively?

Harvey M. Wagner
Chapel Hill, North Carolina

A: *PRINT.COM* is one of my favorite DOS programs. I use it all the time for background printing, and I also find it fascinating from a purely technical perspective.

PRINT was introduced with DOS 2.0. It is a resident program that prints disk files while other programs are running. It is thus fundamentally different from other "background" (or spooler) printing programs. Most of the latter create a software print buffer by allocating a large chunk of user memory to act as a holding area for text that is to be sent to the printer. The print buffer program intercepts printer output, stores it in the created memory buffer, and then later transfers it to the printer. This frees up the system for other activities.

The DOS *PRINT.COM*, however, transfers disk files to the printer directly and so takes up much less memory than a buffer-based program. The size of the files is limited only by disk space, not by the size of a preallocated spooling buffer. (Once a regular print RAM buffer becomes full, further transfer into the buffer slows down to the speed of the printer.)

Although *PRINT* can be used with a diskette system (if you don't change the diskette containing the print file while printing is in progress), it is best suited for a hard disk system.

The *PRINT.COM* program in DOS Versions 2.0 and 2.1 definitely had prob-

lems, however, which is why many people chose to ignore it. Directory paths could not be specified with the filename, and the operation of *PRINT* could not be optimized for particular printers, for example. But the *PRINT* Versions 3.0 and 3.1 corrected these problems. The new parameters are designed to help you optimize *PRINT* for your system, your printer, and your needs. The problem, as your letter suggests, is that the PC-DOS manual discusses these parameters in an obscure and generally unhelpful manner.

The /D (device name) and /Q (queue size) parameters are simple enough. Normally, /D:PRN or /D:LPT1 will be specified, so you'll print to the first parallel printer. /Q can be set to the largest number of files you'll want to print at one time.

The /B parameter sets the buffer size; its default is 512 bytes. This is the amount of memory *PRINT* will set aside for reading the disk file. The default value means that the print file will be 512 bytes at a time. If the buffer is too small, you'll see frequent disk accesses, particularly with a fast printer. If the buffer is too large, the disk accesses will be less frequent but will take slightly longer, and *PRINT* will occupy more memory—more like a traditional spooler.

For a hard disk system with 640K, I recommend setting the buffer size at something like 4,096 or 8,192, both of which will work efficiently because they are multiples of 512.

To understand the /S, /M, and /U parameters, we'll have to take a look at how *PRINT* works.

The Clock Is Ticking

During operation of the PC, the 8253 timer chip invokes a hardware interrupt (08h) 18.2 times per second, or about once every 0.055 second. This interrupt executes a short routine in the ROM BIOS. The main job of that routine is to count the

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number of times it has been called, so DOS can know what time it is. Additionally, however, the Interrupt 08h routine invokes Interrupt 1Ch, often called the "Timer Tick." PRINT intercepts the Timer Tick interrupt to trigger its own operation.

The *IS* parameter, which the IBM manual calls the "Time Slice," is the number of timer ticks during which PRINT will sit idle, doing nothing. During this time the rest of the PC system operates normally, as if PRINT had not been called at all. Thus, the *IS* parameter should really be called the "System Time Slice."

The *IM* parameter, called "MaxTick," is the number of timer ticks during which PRINT actively tries to shovel characters out to the printer. This is really the time slice allocated to PRINT. Assuming that the printer is ready to receive these characters, PRINT will have nearly total control during this period, and any other programs that are running will be suspended.

The default settings are *IM*:2 and *IS*:8. This means that PRINT is alternately active for 0.11 second and inactive for 0.44 second (assuming that the printer is ready to accept characters when PRINT tries to send them down the line). Consequently, PRINT will be working 20 percent of the time; any other program will work at 80 percent of normal speed.

The *IU* parameter, which IBM calls the "Busy Tick," only comes into play if the printer happens to be busy at the moment when PRINT attempts to send it a character. The default value is *IU*:1, which means that PRINT will wait one clock tick (0.055 second) before relinquishing its *IM* time slice. The rest of the system then goes back to work for *IS* timer ticks before PRINT makes another attempt to feed the printer.

PRINT also gives up its time slice if a disk access is in progress. The reason for this is obvious: if PRINT has to get another piece of the file during this time, then real problems could develop should another program be accessing the disk. PRINT's time slice is also forfeited if a DOS function call is in progress. I'll return to this last point shortly, for it has some very interesting consequences.

If *IM* is very high in relation to *IS*, you'll notice a significant degradation in system speed. If *IM* is too low, however, printing will not proceed as fast as the printer can

manage. If *IU* is too high, PRINT may spend too much time just checking the printer without actually printing anything if the printer is busy.

One problem with PRINT.COM is that all these parameters may only be specified when PRINT is first loaded. So, unless you like doing little three-finger exercises repeatedly, you would normally have a very difficult time optimizing the parameters for your system. However, I've found a solution for that.

Fine-tuning PRINT

Mr. Wagner didn't mention what type of printer he had, so I'll first discuss the "standard" (though recently discontinued) IBM Personal Computer Graphics Printer.

The IBM Graphics Printer has an 80-character internal buffer. It will not begin printing until the buffer is full or until the printer receives a carriage return or a form feed. When the printer does begin printing, it remains busy and cannot accept any more characters until its internal buffer is empty.

The optimum parameter settings for this printer, then, consist of an *IM* value equal to the number of timer ticks needed for PRINT to fill the printer's buffer, and an *IS* value equal to the timer ticks required for the printer to print the contents of the buffer.

The short PRINTSET.BAS BASIC program shown in Figure 1 will let you experiment with PRINT settings after PRINT has been loaded. Load PRINT for a reasonably large average file of the type you usually print.

PRINT bigfile

Go into BASICA, load the PRINTSET program, and run it. The program will ask whether DOS 3.0 or 3.1 is being used (be honest, please).

The PRINTSET program shows the current settings of the *IS*, *IM*, and *IU* parameters. You may change any parameter by entering the letter (S, M, or U in either upper- or lowercase), followed by a comma, followed by the new value from 1 to 255. To exit PRINTSET, press the Ctrl-Break key.

For the IBM Graphics Printer, start off by setting *IM* and *IU* equal to 1, and *IS* to

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though, to initially load PRINT before you use it from within another program, since you don't want to make it resident on top of another application.

There's Always an Exception

But here's the real kicker: at the DOS command level, and during execution of any program that uses DOS function calls to obtain keyboard input, PRINT operates in a totally different manner, and none of the good stuff I've just explained about timer ticks is applicable.

Check it out. You could set completely wrong values for PRINT (/S to 255 and /M to 1) and when you exit BASIC to DOS, your printer will churn away, printing your text as fast as possible. To understand why this is so, we'll have to take a look at the more technical internal workings of PRINT.

Inside PRINT.COM

Because PRINT works with disk files, it must make DOS calls to pull these files into memory. During a DOS function call, DOS switches to an internal stack. DOS actually maintains three stacks: one for function calls 01h through 0Ch; another for function calls 0Dh and above (which includes the file accesses); and a third for function calls 01h through 0Ch when a Critical Error is in progress.

Because of this internal stack, PRINT (or any other multitasking utility triggered by a hardware interrupt) cannot arbitrarily make DOS function calls to access a disk file. If another program is making a DOS function call, PRINT's function calls may clobber the internal stack and eventually cause the system to crash.

To prevent this, PRINT uses the undocumented DOS Interrupt 21h function call 34h when it is first loaded. This function call returns registers ES:BX pointing to a byte in DOS. Whenever this byte is nonzero, a DOS function call is in progress. When PRINT is triggered by a timer tick, it checks this byte. If it's nonzero, PRINT just returns from the interrupt without attempting to print anything.

Now this creates a real problem, because on the DOS command level, COMMAND.COM executes a DOS function call 0Ah for keyboard input, and this DOS call remains in progress until the user

presses the Enter key at the end of a line. Many other DOS programs, such as DEBUG or EDLIN, also use this function call.

So, PRINT takes advantage of still another undocumented feature of DOS: Interrupt 28h. PC-DOS itself continually executes an Interrupt 28h whenever it is in a wait state (that is, when it is waiting for keyboard input) during a function call of 01h through 0Ch.

When an Interrupt 28h is invoked, PRINT knows that a function call of 01h through 0Ch is in progress. Because a separate stack is used for function calls of 0Dh and above, which includes all the file accesses, PRINT knows that it's safe to retrieve a file if necessary.

PRINT will always grind to a halt during any disk access. But you'll also see it stop during a TYPE command after the disk has been accessed. This is because TYPE uses function call 40h to write the file to the display, and PRINT cannot use DOS during that time.

Anyone who believes that multitasking is simple to implement in PC-DOS should disassemble PRINT.COM and take a look at the backflips and contortions required for simple background printing from disk files. When the rumored PC-DOS 4.0 gives us a true multitasking operating system (we hope), PRINT will be dramatically outclassed, but until that time, it's one of the most interesting parts of the operating system.

Interrupt Sharing

One final note about PRINTSET.BAS: the program uses the segment address of Interrupt 2Fh to find the location of PRINT in memory. This interrupt allows subsequent PRINT runs to transfer filenames to the initially loaded PRINT. But SHARE also uses Interrupt 2Fh, so if you want to use PRINTSET and you also use SHARE, run SHARE before PRINT. That way PRINTSET won't change bytes in the SHARE program.

The PC Tutor solves practical problems and explains points of general interest. If you would like to see your questions answered here, drop a line to PC Tutor, PC Magazine, One Park Avenue, New York, NY 10016.

PG Reviews in Brief

Accelerator:PC Keys in on Speed and Handling

BY JAMES LANGDELL

Despite this program's name, don't get your hopes up. This utility won't accelerate spreadsheet calculations, database sorting, or text file reformatting. The only part of your computer that *Accelerator:PC* is going to speed up is your keyboard. If you're not already a competition-level typist, this means *Accelerator:PC* will make a significant improvement only in the rate that the cursor moves through your documents and spreadsheets.

The program's installation procedure offers menu selection for values of your keyboard's acceleration and responsiveness levels, on a scale from 0 (normal keyboard) to 9 (the fastest)—settings that can be changed only by reinstalling the program. At the highest acceleration value, the cursor traveled through 100 rows of a spreadsheet over twice as fast as normal in *Multiplan* (from 12 to 5 seconds) and in two-thirds of the normal time for Lotus's *1-2-3* (from 15 to 10 seconds). That's a helpful boost, but it falls short of the 800 percent increase promised on the program's acceleration menu.

Speed increases were even less dramatic for motion across a 50 column spreadsheet, but

the utility made cursor movement significantly smoother in both spreadsheets. I could hold down an arrow key continuously until the cursor reached its destination without seeing the screen freeze and lurch in the midst of desperate beeping from the PC. Except at the highest settings, *Accelerator:PC* didn't cause type-ahead problems. When I'd lift my finger off a key, the cursor would stop immediately.

The manual warns that *Accelerator:PC* can't be used with programs that take over the keyboard, such as the *Leading Edge* and *XyWrite* word processors, and is of limited use with



The *Accelerator:PC* keyboard enhancer from Swift, Inc.

Framework and *WordStar 3.3*, because these programs are unable to handle accelerated keyboard input. However, it only uses 1K byte of memory and should be compatible with *SideKick*, *Spotlight*, and *ProKey* if

you load it first.

Accelerator:PC is easy to use and effective as far as the keyboard is concerned. But since it sells for \$99.95, you might expect it to enliven the computer's internal processing too. ■

Word Finder: Shaping Those Elusive Thoughts

BY DAVID OBREGÓN

I grew up without a thesaurus. Indeed, not until I was in college and struggling with a mediocre first novel did I discover that someone named Roget had meticulously organized words into categories by their meaning—to my way of thinking, a task on a par with climbing Mount Everest wearing swimming flippers. Roget's work has held an honored place in my library ever since.

The *Word Finder* program promises to supplant (replace, usurp) that worthy (noble, estimable) volume in my daily writing. With it, I no longer need to interrupt my train of thought, reach around behind me for Roget's 5-pound tome, and search through its thousand-fold list-

ings to come up with a synonym for that word (expression, statement, utterance) bothering me on my computer screen. Instead, I place my word proces-

sor's cursor anywhere within the offending character string, hit Ctrl-F6, and a window pops up listing all sorts of meaningful replacements.

A computerized thesaurus, *Word Finder*'s dictionary file contains 90,000 synonyms for over 9,000 key words. If you try to look up a word not in its dictionary, the program provides a



Word Finder, a RAM-resident thesaurus from Writing Consultants, Inc.

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list of the closest 30 words it does contain—a provision that also serves as a rudimentary spelling checker. The executable portion of *Word Finder* resides in 32K bytes of RAM, while the 156K-byte dictionary file sits quietly on disk waiting to be called. The arrangement provides a remarkably fast response—exactly what's called for when the Muses are upon you. *Word Finder* is an affordable adjunct for whipping (flogging, thrashing) your prose into shape quickly and efficiently, without leaving the document file you're working in.

Alas, if you've got a 128K RAM system and also run programs like *SideKick* or *ProKey*, you'll quickly discover it might be better to constantly reach for Roget's 5-pound tome across your desk than give up your precious RAM workspace. This program uses up more memory space than anyone but a professional writer can easily justify. What's worse, once *Word Finder* is in memory, it's there for good. Even the Ctrl-Home-End combination that clears *SideKick*, *SuperKey*, and other RAM-resident programs from RAM won't budge it. If your word processing is limited to an occasional letter, *Word Finder* is not for you.

If you're like me, though, and you do a lot of word processing, you're going to like *Word Finder*. This is a useful writing tool, a complement to

both word processing and such RAM-resident programs as *SideKick*, *ProKey*, and *SmartKey*, and a whole lot easier to learn. Versions of *Word Finder* are available for *WordStar*, *Microsoft Word*, *MultiMate*, *Word Perfect*, *PFS:Write*, *IBM Writing Assistant*, and *EasyWriter*. The accompanying manual is about two pages long, which is enough to learn all you need to know to effectively use the program.

Writing Consultants has promised new versions of the program that can be easily removed from memory when not needed, that take up less space in RAM when loaded, and that have larger dictionary files with more words. Indeed, if the company makes good on its promises, Roget's original work may become a historical footnote and doorstop. For a working writer (author, scribe), that's good news. Who really needs to luff heavy (ponderous, substantial) reference books all day? ■

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The Concepts Customized Atlas world view, from Software Concepts, Inc.

released, *Atlas* displays the name of the city closest to the cursor in the bottom left-hand corner of your screen. The latitude and longitude of the cursor are always displayed in the bottom right-hand corner of your screen. You can also draw a grid with lines spaced at 20-degree intervals over the globe by pressing Alt-G.

If you can't spell the city's name, type in the first couple of letters and hit Enter; cities that begin with the letters indicated will appear one at a time in alphabetical order. You can quickly and easily draw continents using the "continent" menu, which calls up stored views of Africa, Antarctica, Asia, Australia, Europe, North America, and South America.

Atlas's "fact" menu lists the name of the city at which the cursor is pointed and its population. If you are looking at the United States or Canada, *Atlas* also notes the name of the state or province the city is in, its area, and its capital. For every city, *Atlas* names the country, capital of the country, monetary unit used, and its principal language.

One quirk: Since the program is city oriented, it automatically provides the name of the city closest to the cursor. To learn the name of the country the cursor is in, you must call up the "fact" menu.

The "distances" menu lets you measure the distance between any two points on the globe in miles, kilometers, or nautical miles. The "zoom" menu allows you to view a location in different scales: the

smallest is half the globe; the largest scale allows you to blow up an area the size of the United States and Canada until it fills the screen. Finally, you can store up to 10 views of areas you survey frequently with the "save" menu.

Atlas does all of its functions easily and well, but there's a lot the program doesn't do. For example, *Atlas* does not show topographical features such as mountain ranges, rivers, and so forth. The program is also slow: It plods along for nearly a minute to draw the smallest globe; redrawing the globe in its blown-up form takes nearly 2 minutes. Finally, you can only print a view using the Shift-Print key combination, which produces printouts that look like a blob vaguely resembling the outline of a continent.

While *Atlas* is fun to play with, it seems like computerization for its own sake. There is little improvement here over the globes and atlases found in every grammar-school. Its slow speed and lack of detail are also significant disadvantages. ■

The World on Your Screen: Customized Atlas

BY CHERYL GOLDBERG

Like a globe, *Concepts Customized Atlas* from Software Concepts gives a colorful, rotatable view of oceans and of continents with their political divisions. Like an atlas, *Atlas* provides facts about 2,500 cities and countries, maps land areas to different scales, and measures distances between points on the globe. Unlike a globe or an atlas, *Concepts Customized Atlas* does all of the above on

your computer's screen.

You can rotate *Atlas*'s screen globe almost as easily as you can turn a real globe in your hands. Just move the cursor to the location you wish to view, or type the name of a place not visible on the screen and press Home. The globe is then redrawn with the specified location centered on the screen. If you want to learn the name of a place, you move the cursor to that location on the displayed globe. When the cursor key is

Concepts Computerized Atlas

Software Concepts, Inc.
P.O. Box 3323
Wallingford, CT 06604
(800) 782-4567
(203) 634-4193

List Price: \$69.95;
demo disk, \$5.00

Requires: 128K RAM,
color graphics board,
color monitor.

CIRCLE 670 ON READER SERVICE CARD

THE SHORT REPORT BY PHIL WISWELL

Strategic Weapons for the Business Battlefield

Dow Jones Prospect Organizer

If the dog-eat-dog world of sales leaves you hungry, perhaps you need a better knife and fork. *Dow Jones Prospect Organizer* is just such a tool. The program integrates extensive database management with a word processor, a programmable calculator, and an excellent report generator to help a sales staff maintain and follow through on sales leads. *Prospect Organizer* lets you customize a database around the two areas most crucial to a sales campaign—your company's products and the interests of your prospects—and will analyze the effectiveness of your media and promotion.

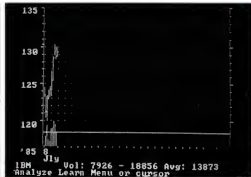
A visual menu structure simplifies the operation of this flexible, powerful system, and the interactive tutorial doubles as excellent on-line help. The first screen of each three-screen prospect record contains the basic information about the company and the status of your sales efforts so far. The other two screens list such fields as primary and alternate contacts, dates of contacts, annual sales, competitors, product interests, and space for comments. But what really makes the program useful is its more-than-adequate word processor, which helps generate individual letters, mass

mailings, and telemarketing scripts. *Dow Jones Prospect Organizer* (Dow Jones & Company, Inc., P.O. Box 300, Princeton, NJ 08540; \$395 plus \$2.50 handling; for PC, XT, AT, and Compaq; requires 256K RAM, two disk drives, DOS 2.x).

Synstock

Maintaining a record of your portfolio is an important ingredient for successful stock market investments, but what butters the bread is the ability to analyze data and identify trends. If you have no qualms about paying a broker for these services, fine. If not, you can do yourself a favor and do it yourself with *Synstock* (Broderbund Software, Inc., 17 Paul Dr., San Rafael, CA 94903-2101; \$99.95; needs 192K RAM, color/graphics adapter, DOS 2.x).

Synstock allows you to record the stocks you want—either manually or downloaded from Dow Jones, CompuServe, or Warner Computer Services—and the program automatically graphs the individual stocks. You can request the data or graph for a stock to be displayed on screen or printed, and you can include all or selected quotes. *Synstock* even scans the quotes and flags any daily gaps



Graphic analysis screen from *Synstock* by Vertical Solutions.

in your entries, ignoring week-ends. The menu system is simple and bypasses complicated procedures such as manual log-on, downloading and exporting files, subdirectory maintenance, and charting.

This "all meat, no filler" package can earn back its weight in brokerage fees in a month or two.

could define each report yourself in a few minutes. (Vertical Solutions, Inc., P.O. Box 5051, Evanston, IL 60204; \$50 plus \$5 handling; requires: PFS: *FILE* or *IBM Filing Assistant*).

Importer!

Vertical Solutions has also introduced three other PFS-compatible programs, including *Importer!*, which imports data from any source into a PFS:FILE database of your own creation. The tricky part is getting the data from the source into a file with the proper ASCII format, and *Importer!* can't help you with that. But once you have a columnar-format ASCII file, it's a snap to bring it into PFS:FILE or *IBM Filing Assistant* by way of this program.

Importer!'s à la carte main menu resembles the PFS design, with three choices besides exiting to DOS. The first option lets you view the data you wish to import. The second lets you specify column headings and desired data with a simple highlighting method, matching columns to the fields in your database. The last menu selection automatically imports the data and lets you check its validity. (Vertical Solutions, Inc., P.O. Box 5051, Evanston, IL 60204; \$140; requires 128K RAM, DOS 2.x).

Market Prospector

Market Prospector, another sales-support tool, is a database template designed for use with the wonderfully easy PFS:FILE or *IBM Filing Assistant* programs. The template is simple and it works well. However, if you own PFS:FILE or *IBM Filing Assistant*, you could create this same template from scratch in about half an hour. At least, that's how long it took me to duplicate the design, and I liked my version better.

First you start PFS:FILE and begin adding data to the *Market Prospector* file, which consists of 36 fields covering prospective client information. The fields are grouped into data on the prospect, the follow-up, demographics, and product potential. If you also own PFS:REPORT or *IBM Reporting Assistant*, the template comes with five predefined reports for those programs. Again, you

Dow Jones Prospect Organizer from Dow Jones & Co., Inc.

IBM

IBM PC, 256K, One Half Height 320K Disk Drive DS/DD, Persyst Color Card With Printer Port, Taxan Green Monitor, DOS 2.1, PLUS a 10MB Hard Disk Sub System All For:

\$2599.

IBM PC, 256K, Two Half Height Drives DS/DD, Persyst Color Card With Printer Port, Taxan Green Monitor, DOS 2.1, 130 Watt Power Supply PLUS a 10MB Hard Disk Sub System All For:

\$2899.

IBM PC, 256K, Two Half Height Drives DS/DD, Persyst Color Card With Printer Port, Taxan Green Monitor, DOS 2.1, 130 Watt Power Supply, 10MB Hard Disk Sub System, PLUS 10MB Tape Back Up System All For:

\$3499.

IBM PC, 256K, Two Half Height Drives DS/DD, Persyst Color Card With Printer Port, Taxan Green Monitor, DOS 2.1, 130 Watt Power Supply, 20MB Hard Disk Sub System All For:

\$3299.

IBM PC, 256K, Two Half Height Drives DS/DD, Persyst Color Card With Printer Port, Taxan Green Monitor, DOS 2.1, 130 Watt Power Supply, 20MB Hard Disk Sub System, PLUS 10MB Tape Back Up System All For:

\$3899.

MONITORS

AMDEK 300 Green	\$135.00
AMDEK 300 Amber	\$149.00
AMDEK 310 Amber W/TTL Plug	\$165.00
PGS HX-12	\$465.00
PGS MAX-12	\$185.00
PGS SR-12	\$925.00
TAXAN #115 Green Composit	\$125.00
TAXAN #116 Amber Composit	\$135.00
TAXAN #121 Green W/TTL Plug	\$149.00
TAXAN #122 Amber W/TTL Plug	\$159.00
TAXAN #425 COLOR MONITOR	\$449.00
TAXAN #440 COLOR MONITOR	\$569.00
IBM MONOCHROME DISPLAY	\$260.00
IBM COLOR DISPLAY	\$590.00

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EPSON FX 100	\$525.00
EPSON RX 100	\$399.00
EPSON JX 80	\$325.00
EPSON LQ 1500	\$925.00
COMREX CR 420	\$1895.00
TOSHIBA 361	\$1275.00
STAR MICRONICS SG 10	\$759.00
STAR MICRONICS SG 15	\$395.00
CITIZEN PRINTER MSP-10	\$349.00
CITIZEN PRINTER MSP-15	\$485.00
CITIZEN PRINTER MSP-20	\$499.00
CITIZEN PRINTER MSP-25	\$699.00
JUKI LQ 6100	\$425.00
JUKI LQ 6300	\$745.00
BROTHER HR-25	\$825.00
BROTHER HR-35	\$895.00
DYNAX DX 15XL	\$399.00
OKIDATA	CALL

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COMREX 6600**

\$169.00**MODEMS**

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HAYES SMART MODEM 300	\$209.00
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HAYES 2400 BAUD MODEM	\$699.00
POP COM 1200 EXTERNAL	\$375.00
AST REACH MODEM	\$389.00
QIC MODEM INTERNAL	\$275.00

DRIVES

TANDON TM-100-2 DS/DD	\$155.00
TOSHIBA SLIMLINE DS/DD	\$139.00
TEAC SLIMLINE DS/DD	\$139.00

HARD DISKS

10MB SUB SYSTEM INTERNAL	\$750.00
EXTERNAL	\$925.00
20MB SUB SYSTEM INTERNAL	\$975.00
EXTERNAL	\$1150.00
40MB SUB SYSTEM INTERNAL	\$1295.00
EXTERNAL	\$1475.00

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(EXTERNAL)**

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W/10MB TAPE BACK UP	\$1250.00
20MB HARD DISK	
W/10MB TAPE BACK UP	\$1475.00
40MB HARD DISK	
W/10MB TAPE BACK UP	\$1795.00

CONQUEST
**PC
TURBO**

CONQUEST PC TURBO 256K Two Half Height Drives, Floppy Disk Controller 135 Watt Power Supply, Serial Port, Parallel Port (IBM Standard), Enhanced Keyboard, Monochrome or Color Adapter with Green or Amber Monitor All for:

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Above System With 10MB Internal Hard Disk:

\$2295.

With 20MB Internal Hard Disk:

\$2520.

With 40MB Internal Hard Disk:

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Tape Back Up Systems Are Also Available for the Conquest PC Turbo at a Nominal Price.

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ALR CHALLENGER CARD	
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PRINTER ADAPTER	\$179.00
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HERCULES COLOR	
PRINTER ADAPTER	\$179.00
HERCULES GRAPHIC	
PRINTER ADAPTER	\$319.00
STB GRAPHIC PLUS II	\$325.00
IBM COLOR GRAPHIC ADAPTER	\$225.00
IBM MONO PRINTER ADAPTER	\$230.00
GENOA SPECTRUM GRAPHIC CARD	\$349.00

GENERAL

MAXELL DISKETTES MD2	\$35.00/box
MAXELL MD2-HDM FOR AT	\$65.00/box
CONTROL DATA DISKETTES	\$24.00
KEYTRONIC KEYBOARD KB 5151	\$179.00

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available

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COMPUTER PRODUCTS**(714) 838-7530**

2630 Walnut Avenue, Unit C, Tustin, California 92680

Prices & availability subject to change without notice—IBM is a registered trademark of IBM Corporation. COMPAQ is a registered trademark of COMPAQ Computer Corporation. Conquest is a registered trademark of Conquest Computer Industries.

CIRCLE 338 ON READER SERVICE CARD

New on the Market

DATA SPEC Cables

Alliance Research Corp. has redesigned its line of DATA SPEC cable assemblies for microcomputer equipment. The new cable assemblies feature molded, easy-grip connectors and large, textured thumb-screws on the DB25 models. The cable assemblies also fea-

Fundwatch

Hamilton Software has released a program for home users called *Fundwatch*, designed to simplify investment tracking. The program can be used to record and evaluate stocks, commodities, and mutual funds from data entered by the user. It does not require the use of a modem or additional software.

Fundwatch can predict investment yields, reveal trends, and maintain basic portfolio information. It also produces comparisons for virtually any growth-oriented investments.

List Price: \$24.95

Requires: 128K RAM, one disk drive, PC-DOS.

Hamilton Software

P.O. Box 231385

San Diego, CA 92123

(819) 571-6173

Circle 660 on Reader Service Card

WP Toolset

Text files can now be transported from one word processing system to another with *WP Toolset* from Information Reduction Research. The utility translates a wide range of proprietary text file structures, allowing any file to be converted for use by such software as *WordStar*, *Volkswriter*, *MultiMate*, *Samna*, *XyWriter*, *MicroSoft Word*, and others.

WP Toolset also supports conversion from the IBM Document Content Architecture Revisable Form Text format and performs ASCII-to-EBCDIC translation. It also includes a



Linegard 300, SL WABER Div., SL Industries

general-purpose filter designed to transform a file according to any set of substitutions provided by the user.

List Price: \$75

Requires: 128K RAM, one disk drive, PC-DOS.

Information Reduction Research

28 Ridgewood Rd.

Concord, MA 01742

(617) 369-5719

Circle 659 on Reader Service Card

Linegard 300

A true, uninterruptible power supply, the Linegard 300 from SL WABER is designed to provide a continuous, regulated source of power with emergency backup provisions. An internal battery provides protection against power interruptions due to blackouts or brownouts, while sophisticated power regulation circuitry protects the user's equipment against transient voltage surges and sags as well

as line-noise interference.

List Price: Available from the manufacturer

SL WABER Div., SL Industries

300 Harvard Ave.

Westville, NJ 08093

(800) 257-8384

(609) 456-5400

Circle 658 on Reader Service Card

Laserdisc

Controller/Overlay and Color/Graphics Boards

Poseidon Systems of Boulder, Colorado, has produced a controller board permitting PC users to interactively control up to two video laserdisk players connected to their systems. In addition, the board permits the user to overlay computer-generated graphics on the videodisk image appearing on the display. Additional features of the Controller/Overlay Board include screen switching between videodisk and PC, and conversion of the videodisk image



DATA SPEC Cables, Alliance Research Corp.

ture the two-tone gray of the IBM PC.

List Price: Varies according to cable

Alliance Research Corp.

20120 Plummer St.

P.O. Box 4029

Chatsworth, CA 91313

(818) 993-1202

Circle 661 on Reader Service Card

New on the Market Submissions Guide

All submissions to New on the Market should follow these guidelines:

1. Include the retail price and details of both hardware and software needed for an end-user to properly use your new product. This includes required amount of RAM, number and type of drives, operating systems supported, and peripheral equipment needed.
2. Releases should be typewritten double-spaced on one side of the paper. Copies of advertisements may be included, but in most instances we need more information than is typically included in an ad. Include telephone contacts for marketing and technical questions.
3. If available, include black & white glossy photos of the product, 4 x 5 inches or larger.

New on the Market does not review products; do not send sample or demo copies of software. All product announcements are run on a space-available basis, at the exclusive discretion of the editor. Please note that it is impossible to guarantee publication of a product announcement for any particular issue.

from NTSC to RGB.

The Poscidon Color/ Graphics Board produces enhanced graphics taking full advantage of the Controller/ Overlay Board's capabilities. The board produces IBM-compatible graphics, as well as high-resolution 600 x 200 graphics.

List Price: Controller/Overlay, \$675; Color/Graphics, \$375
Poscidon Systems, Inc.
 5500 Central Ave.
 Boulder, CO 80301
 (303) 449-4999

Circle 657 on Reader Service Card

Smart Answering Machine (SAM)

Dialectron is offering a telephone management system with speech storage and playback capability, in the form of a small plug-in board with supporting software. The SAM system provides all of the features of sophisticated telephone answering machines, as well as several features unique to the system.

As a telephone answering machine, SAM allows the user to leave a general message for all callers and specific messages for individual callers, identified to the system by coded Touch-Tone sequences. The system can also provide any caller with data on several topics, which the caller selects by touching keys on his phone.

Unlike a dedicated answering machine, the SAM system can also dial a number (or numbers) at any preselected time, ask for

a person by name, and then deliver a message to that person. This message can be protected by requiring the recipient to enter a personal ID code, or it can be delivered to whomever answers.

All of SAM's features are remotely accessible from any telephone. Authorized persons can review messages, save them to disk or delete them from memory, or have the messages forwarded to another individual at any number. Using a Touch-Tone ID code, the caller can remotely record new greeting messages and personal messages for various individuals.

The included menu-driven support software uses data compression techniques to record voices on disk.

List Price: \$295
Requires: 256K RAM, one disk drive, PC-DOS.
Dialectron, Inc.
 2035 California St., #17
 Mountain View, CA 94040
 (415) 960-3040

Circle 658 on Reader Service Card

Persyst Mini-Mono Card

Emulex Corp. has added a new display adapter to its Persyst line of PC add-on boards. The Persyst Mini-Mono Card offers IBM monochrome adapter compatibility, a lightpen interface, and an optional, bidirectional parallel port on a half-size board.

Display attributes of the board include a text display using a 7- by 9-dot character in a

9- by 14-dot cell. It uses 4K of display memory, accessible by DMA operations. The optional parallel port supports either Centronics or Dataproducts printer interfaces or can be used as a bidirectional parallel interface for I/O operations.

List Price: without parallel port, \$225; with port, \$250
Emulex Corp.
 3545 Harbor Blvd.
 P.O. Box 8725
 Costa Mesa, CA 92626
 (714) 882-5800

Circle 655 on Reader Service Card

CAFE and FED

The Whitewater Group, Inc. has introduced two low-cost file editors. **CAFE** is a charts and forms editor useful for creating flowcharts, organization tables, forms, engineering diagrams, and more. **FED** is a file editor providing direct access to both hex and ASCII formats to any file on disk.

CAFE can display the complete IBM character set and allows user-defined characters and programmable macro keys. It operates in full-screen mode, with direct cursor placement via cursor keys. Charts created with the editor can be printed on Epson or IBM printers.

FED divides the screen into two windows, displaying a file in both hex and ASCII formats. The cursor can be moved within either window or between windows, and the user can modify the contents of either window.

List Price: **CAFE**, \$69;
FED, \$49
Requires: 128K RAM, one disk drive, PC-DOS 2.0.
The Whitewater Group, Inc.
 2912 N. Burling Ave.
 Chicago, IL 60657
 (312) 975-6095

Circle 654 on Reader Service Card

TAS-Based Applications

Business Tools, Inc. has released a family of business programs based upon a relational database management system called **TAS**. **TAS** offers a procedural programming language, a data dictionary, a run-time compiler, and the ability to handle



up to 17 million records.

Accounting Solutions Level 2 includes the DBMS plus general ledger, accounts receivable, and accounts payable programs. **Accounting Solutions Level 3** adds payroll, inventory control, sales order entry, and purchase order entry to the **Accounting Solutions Level 2** system.

List Price: **TAS**, \$99; **Accounting Solutions Level 2**, \$249; **Level 3**, \$399

Requires: 128K RAM, two disk drives, PC-DOS.

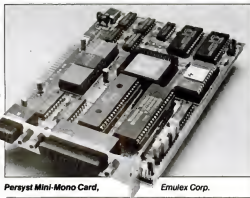
Business Tools, Inc.
 4038-B 128th Ave. S.E.
 Bellevue, WA 98006
 (800) 648-6258
 (206) 648-2015

Circle 653 on Reader Service Card

BBS-PC

Micro-Systems Software is offering a full-featured electronic bulletin-board software package that supports electronic mail, binary or ASCII file transfers, and more. **BBS-PC** provides 16 separate sections (subboards), four different file transfer protocols, and a "terminal mode" feature that permits simultaneous use of two COM ports, modems, and phone lines. This last feature can automatically forward calls to other systems, answer either of the two phone lines, or answer one line while reserving the other for outgoing calls.

BBS-PC can be used to establish



Persyst Mini-Mono Card,

Emulex Corp.

lish a complete bulletin board system giving the sysop (system operator) complete control over caller access to the system and each of its 16 sections. Security provisions allow sections to be designated as open or restricted, with up to 256 security levels possible. These provisions allow the sysop to control a caller's read, write, upload, or download privileges on each section.

The system can handle transmission rates of up to 2,400 bits per second. For file transfers, it supports Modem, Xmodem, Modem7, and other Modem family transfer protocols, plus standard ASCII line- or block-transmission modes. Message and file upload queuing permits the sysop to review material before general access is allowed. Selectable options allow the sysop to configure COM parameters, line-feed options, message base size, member base size, and the directory paths for each section's files.

Other features of **BBS-PC** include message reformatting to the caller's terminal, permanent user records, and a message transfer system that creates files accessible only by the addressee or sysop. Message space is reclaimed when messages are deleted. The system is designed to be crash-resistant and can automatically handle the loss of a carrier signal without requiring a reset, even during file transfers.

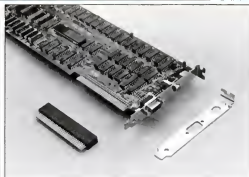
List Price: \$249
Requires: 256K RAM, two disk drives, PC-DOS, serial communications adapter, modem.
Micro-Systems Software, Inc.
4301-18 Oak Cir.
Boca Raton, FL 33431
(305) 391-5077

Circle 652 on Reader Service Card

Kleen Line RS-232 Bus Protection

Electronic Specialists, Inc. has produced a line of surge and spike suppressors intended to protect RS-232 serial communications lines against high-voltage transients. Models are available that protect from 4 to 24 lines in a serial connection.

The Kleen Line RS-232 de-



Free-A-Slot, Network Controls International, Inc.

VICES use RF filtering technology as well as semiconductor and gas-discharge methods to suppress voltage spikes. Applications for the devices include modem lines, local area networks, and serial printer lines.

List Price: 4-line model, \$134
Electronic Specialists, Inc.
171 S. Main St.
Natick, MA 01760
(617) 655-1532

Circle 651 on Reader Service Card

FASTSCREEN

Technisoft has released a set of screen-generating routines that can be incorporated into programs written under Turbo Pascal. The routines, known collectively as **FASTSCREEN**, can

display a full I/O screen almost instantly. They also let a user map fields on the screen into program variables capable of using full-screen input.

FASTSCREEN consists of Turbo Pascal source code with in-line assembler routines. The routines support the use of either color or monochrome displays and can be used to develop compiled Turbo Pascal programs without incurring obligations to pay royalties.

List Price: \$29.95
Requires: Borland International's Turbo Pascal
Technisoft
1710 Allied St., #37
Charlottesville, VA 22901
(804) 979-6464

Circle 650 on Reader Service Card



Kleen Line RS-232 Bus Protection, Electronic Specialists, Inc.

Free-A-Slot

Users of the IBM PC AT can now switch the IBM Color/Graphics card from its normal 8-bit bus slot to any of the AT's 16-bit bus slots by using the Free-A-Slot board from Network Controls International. This switch frees the color/graphics adapter's single-connector slot for other uses, such as installing terminal emulator or tape backup controller boards.

Free-A-Slot includes a slot extender and a new end-plate for the color/graphics adapter. It is designed to be installed quickly by nontechnical users.

List Price: \$29.95
Network Controls International, Inc.
9 Woodlawn Green, #120
Charlotte, NC 28210
(704) 527-4357

Circle 648 on Reader Service Card

MEX-PC

A communications program compatible with a wide range of modems has been released by NightOwl Software. The command-driven program **MEX-PC** is written in assembly language for speed and includes an on-line help function, plus a command processor that allows the user to automate repetitive routines.

MEX-PC supports three file transfer protocols (including Xmodem CRC and Modem7 Batch), autodialing, direct access to DOS from within the program, and macro key definitions. It can be used with modems from Hayes, U.S. Robotics, Nocation, Racal Vadic, Anchor, and others.

List Price: \$59.95
Requires: 64K RAM, one disk drive, PC-DOS 2.0.
NightOwl Software, Inc.
Rte. 1, Box 7
Fort Atkinson, WI 53538
(800) NITEOWL

Circle 648 on Reader Service Card

COMPUTERFACTS

Howard W. Sams & Co., Inc. is offering a series of technical data manuals for most popular personal computers. The

COMPUTERFACTS handbooks cover the internal workings of systems units, disk drives, printers, and monitors with wiring diagrams, photographs, disassembly instructions, parts lists, and troubleshooting techniques.

The **COMPUTERFACTS** series includes computer systems from IBM, Apple, Commodore, Texas Instruments, and others, plus monitors from Amdek, Hitachi, Panasonic, Sanyo, and Zenith. Printer data is available for units by Epson and NEC. In all, 31 products from 15 manufacturers are included in the series, with additional manuals planned.

List Price: Varies according to individual manual.

Howard W. Sams & Co., Inc.
4300 W. 62d St.
Indianapolis, IN 46226
(317) 298-5400

Circle 647 on Reader Service Card

IDEA Supermax

IDEAssociates has produced a multifunction board for the PC AT that features two serial ports, one parallel port, and up to 4 megabytes of RAM. Memory on a bare Supermax board can be expanded with either 64K chips (for a maximum of 1.5 megabytes) or 256K chips (for a 4-megabyte maximum with piggyback board).

A built-in, split-memory addressing feature of the board rounds out the PC AT's main memory to 640K, extends memory from 1 megabyte and beyond, and permits quick accesses to files by bypassing a full memory search to locate the requested document. Included software features complete diagnostics, a RAMdisk, and a

desk calculator.
List Price: without RAM, \$495; with 4MB RAM, \$3,795
IDEAssociates, Inc.
35 Dunham Rd.
Billerica, MA 01821
(617) 663-6878
Telex: 94-8245

Circle 646 on Reader Service Card

Brilliant Image Graphics Service

Brilliant Image of New York has announced a fast turn-around service that provides full-color slides and printed handouts of graphics produced using software by Lotus, Zenographics, Bell & Howell, and Execucom. The service is available without initial fees or hardware requirements.

Brilliant Image's service can accept graphics created by 1-2-3, Symphony, Mirage, Autumn, Ego, and other software packages. Most orders for color slides or hardcopy printouts can be filled in 24 hours or less. This minimizes the need for users to invest in costly slide-making equipment.

List Price: Average charge per slide, \$10

Brilliant Image
141 W. 28th St.
New York, NY 10001
(212) 736-9661

Circle 645 on Reader Service Card

Read/Right Cleaning Kit

A complete cleaning kit is being offered by the Read/Right division of the Texwipe Co. The kit includes a floppy disk drive cleaner with a metered-head spray that applies a precise amount of cleaning solvent to the special cleaning disk provided.



Read/Right Cleaning Kit, The Texwipe Co.

The package also contains a pump spray bottle of Static Stopper liquid and a special antistatic cloth for cleaning display screens, 24 CRT Terminal Cleaning Pads plus 10 Office Equipment Cleaning Pads. These latter items are pre-moistened wipes for removing dirt and ink from the surfaces of computer equipment.

List Price: \$34.95
The Texwipe Co.
Read/Right Div.
650 E. Crescent Ave.
P.O. Box 575
Upper Saddle River, NJ 07458
(201) 327-9100

Circle 644 on Reader Service Card

Compare***

This utility from Creative Information Systems identifies the differences between two ASCII text or program files that have a common origin. New versions of text or code can be compared to previous files, with differences highlighted in a fully scrollable window on screen.

Compare*** can be set to compress blank lines and spaces in text so that cosmetic formatting changes can be ignored during comparisons. When program code files for such languages as BASIC or FORTRAN are compared, the utility ignores revised line numbers but identifies such labels as GOTO and IF-THEN.

List Price: \$79.95
Requires: 192K RAM, one disk drive, PC-DOS.
Creative Information Systems, Inc.
P.O. Box 30567
Portland, OR 97230
(503) 253-6812

Circle 643 on Reader Service Card

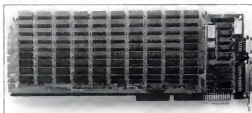
APL2C APL to C Interface

Programs written in APL and C can be linked together with the APL2C interface package from Decision Images. This package gives programmers the advantages of using a compiled language like C for memory-intensive or repetitive operations and an interpretative language like APL for control flexibility.

APL2C links STSC's **APL*Plus/PC** system with the Microsoft or Lattice C compilers. The resulting object modules reside in the user's APL workspace. The software consists of assembly language and APL functions that permit C and APL routines to pass integers, characters, and 8-byte floating-point data back and forth.

List Price: \$150
Requires: APL*Plus/PC and either Microsoft or Lattice C.
Decision Images, Inc.
1000 Herrington Rd.
Princeton, NJ 08540
(609) 683-0234

Circle 642 on Reader Service Card



IDEASupermax, IDEAssociates, Inc.

A DEFINITIVE ENCYCLOPEDIA IS YOURS!

FOR LESS
THAN 92¢
A VOLUME!



ADD-ONS AND ADAPTORS
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Pie in the Sky

The Eudaemonic Pie and The Planiverse explore strange worlds. The first, from the annals of gambling, sounds like fiction, while the second, a fictional account of computer simulation, rings true.

Computers and gambling have been curiously bound together throughout history. Some of the most important computer innovators were also interested in gambling. For example, Blaise Pascal, the inventor of the mechanical adding machine, developed the theory of probability in response to a friend's question about card games; Ada Lovelace, the first programmer, bet on horses; John von Neumann, who developed the architecture of the modern computer, played poker; and Claude Shannon, who made it possible to mathematically describe a computer's electrical circuits, worked on a computer dedicated to beating roulette.

Continuing this tradition, Eudaemonic Enterprises launched Project Rosetta Stone in the mid 1970s. The company, a collection of physicists and dreamers, hackers and entrepreneurs, calling themselves the Projectors, set out to make a killing at roulette using computers. Starting with little more than the then brand-new 6502 chip (the same one found in the Apple II) and a handsome B.C. Wills roulette wheel in the basement, they ultimately developed a program that could

predict where the ball would fall and a computer that fit into a shoe to run it.

The Projectors agreed that they would divide among themselves the "Eudaemonic Pie," which was to be filled with roulette winnings. But what they origi-

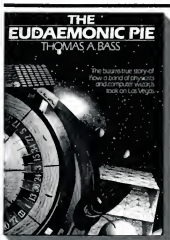
fact—although the story is quite true. It also sounds crazy, which is why *The Eudaemonic Pie* is so much fun to read. Besides being enjoyable, though, it's among the best of a new breed of computer books. For one thing, it is extremely well written. Author Thomas Bass, who was a Projector himself, has an eye for detail and an ear for good prose. He brings to life the people and events of one of the more improbable incidents in computer history.

A Gambler's Life

And what a life it must have been. That first roulette wheel in the basement was soon transformed by a maze of sensors and wires and then joined by another wheel, while shelves overflowed with computer paraphernalia and people stayed up all night spinning the wheel and filling up histograms. Prototype roulette computers (to which they gave names like Raymond, Harry, and Cynthia), coordination-testing computers, and computer-testing computers multiplied seemingly without end. The house near the shore in Santa Cruz, California, where the Project had its headquarters, eventually became a physics lab, a casino, and a commune rolled into one.

Clem from New Mexico

All sorts of people drifted in, contributed something important, and then drifted out again: a member of the Home Brew Computer Club, several counter-culture physicists, a high school science teacher, and professional gamblers among them. The hero of this story, however, is Dooyne Farmer. A hippie physicist, he was a founding member of



nally envisioned as a few month's work leading to a fast fortune soon ballooned into years of labor as they came up against a host of obstacles. Difficulties included formulating the equations that would predict an apparently unpredictable game; writing a program no bigger than 5K bytes to calculate the equations; building a computer from scratch that would run the program, yet be small enough to hide on one's person; and all kinds of other, unforeseen problems.

It sounds more like fiction than



The Eudaemonic Pie

Thomas A. Bass
Houghton Mifflin Co.
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(617) 725-5000

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Price: \$15.95 (hardcover)

ISBN: 0-395-35335-1

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BOOK REVIEW

the Chaos Cabal, a group of young scientists who gained fame in physics and mathematics circles by attempting to describe chaos mathematically, using computers. Doyne kept the books so that the "Pie" could be fairly cut when the money rolled in. Known as "Clem from New Mexico," Doyne drafted the formulas that predicted the outcome of a spin and wrote, entirely in machine language, the program that would execute them.

Beating Roulette

Learning about those formulas and programs is part of what makes this book so special. In addition to getting to know some extraordinary people and witnessing some unusual events, we learn that beating roulette is a significant problem in classical physics—predicting where the ball will land is a product of tilt, drag, bounce, scatter, and other factors less easily named.

Unwelcome Jolts

Also fascinating are the tiny computers themselves, whose novel construction (which included baking) we witness from beginning to end. Stuffed at first in padded bras or armpits with wires running everywhere, the computers sometimes shorted out, giving the wearer an unwelcome jolt. They were later redesigned to fit inside the soles of two pairs of shoes. The decoy player would observe the wheel and input the variables and the parameters of its spin with his toes. A second player would receive this information through solenoids that would poke various parts of his foot, and then he would place a bet.

You're probably curious to know the outcome of all this. Without giving too much away, the story both has an ending and doesn't have one—yet. So the next time you go to COMDEX, check out the roulette wheels. If you see somebody

winning really big, take a close look at his shoes, because he might be Clem from New Mexico.

The Planiverse

Another recent book also has interesting historical antecedents. *The Planiverse* by A. K. Dewdney is based on Ed-



The Planiverse: Computer Contact with a Two-Dimensional World

A. K. Dewdney
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win Abbott's 100-year-old classic, *Flatland*, a charming tour of a two-dimensional world embedded in a table top. Dewdney, a theoretical computer scientist at the University of Western Ontario, has done much more than simply bring *Flatland* up to date. Indeed, *The Planiverse* reveals a great deal about the mind of Dewdney, who writes *Scientific American's* Computer Recreations column, a monthly gold mine of humor, ideas, and projects.

The essence of *The Planiverse* is a computer simulation run amok. As Dewdney tells it, computer science students under his tutelage create a two-dimensional world on the computer screen similar to Abbott's *Flatland*. Then one day, the simulation transforms itself into a communications link with a creature named Yendred (Dewdney spelled backward—sort of) who lives in an actual two-dimensional universe. Yendred hears what the students type at the terminal, while the students get a complete on-screen view of Yendred, his environment, and his thoughts.

Yendred, of course, is not quite sure who has entered his thoughts, and the students are certainly puzzled about what has happened to their original program. But after this initial awkwardness, the students try to learn as much as they can from their newfound friend about life in a two-dimensional universe, and Yendred goes on a quest of his own that takes him far across the single sliver of a continent that lies on his waferlike world, Arde. Yendred's Aridian adventures and the mounting tensions at the computer science department build to a suspenseful climax, while Yendred gradually becomes far more than a cardboard character, even if he is only two-dimensional.

Strangely Compelling

The Planiverse is witty and unusual and strangely compelling. A window into the mind of one of the most creative computer writers today, it is a thought-provoking exploration of a world in which none of the assumptions we make

every minute of every day are valid. As a result, it makes one wonder about the possibility that our own lives, from someone else's point of view, are lacking an important dimension. It is, too, a de-

lightful fantasy of the sort any computer owner might dream—an essay on the potential of the machines to reveal new worlds, if only we could find the right key to press. ■

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PC Product Index

RS#	PRODUCT	ADVERTISER	PAGE#
DISK OPERATING SYSTEMS			
121	QIC 04, QIC 05	QIC Research	148
ACCOUNTING SOFTWARE			
148	Accounting Software	Dac Software	177
112	Tax Base	Dynas	210
140	Lotus Software	W. A. C. Computers	210
241	Accounting Software	In-House Software	44
140	Accounting Software	MCBS	93
115	Base Software	Row Associates	157
1	Accounting For Micros	The James River Group	204
INTEGRATED ACCOUNTING PACKAGES			
263	Integrated Accounting Packages	Macola Inc.	39
COMMUNICATIONS TOOLS			
109	Team On	Dynas Computer Power Inc.	171
COMMUNICATIONS SOFTWARE			
123	Communications Soft	Compu Vector	48
1	Access	Microsoft	138-139
TERMINAL EMULATORS			
565	Simulator/PC	Perot	5
OTHER UTILITIES			
152	Cups II PC	Central Point Software	215
191	Facsimile	Compucon Software	200
206	Utility Software	Elite Software	284
FINANCIAL PLANNING SOFTWARE			
110	Compasoft	A. S. Gibson & Son	69
162	Calc. Results	Stadco Software	175
497	Personal Finance Master	Spectra Software	238
361	Finance Plus	Watcom Associates	201
PORTFOLIO MANAGEMENT			
132	The Learning Program	MICA	165
151	Managing Your Money	MICA	167
GRAPHICS SOFTWARE			
138	Micrograf	Analytics International Inc.	155
122	Gift Of Style	Data Transforms, Inc.	207
239	Photos	Decision Resources	40-41
161	Characterize And Other Products	Hydrographics	232
156	Graphics Software	Hydrographics	232
INFORMATION MANAGERS			
180	File Connection	Playwell Engineering	17
126	InfoLink	Microanal Inc.	89
131	File Link	Bethsoft	11
343	ICM-1 Scientific Calculator	K Software House	250
PROJECT MANAGERS			
187	Project Planner	Primavera Systems	246
187	Project Scheduler Network	Primavera Systems	246
OTHER INFORMATION MANAGERS			
1	Little Black Book	Cyber Technology	91
SOFTWARE FOR PROFESSIONALS			
147	Subtext: Superkey	Borland International	167
ENGINEERS/SCIENTISTS			
119	BBT Mathpak	Hampshire Computer Works	10
331	BBT Chip	Macroway	62
STATISTICAL SOFTWARE			
121	SPSS-PC	SPSS, Inc.	198
361	Stat Pac	Watcom Associates	201
361	Goodness Of Fit	Watcom Associates	201
WORD PROCESSING SOFTWARE			
149	Whorlwind Word-View Spher	CompuSoft	42
154	Word Perfect	Softdisk Software International (SSI)	321
1	WordWrite	ZyQuest	236
WORD PROCESSING AIDS			
116	Laser Print	Riba Software, Inc.	236
178	Soft Type	Phonix Software	189
134	Polaris Printmerge	Polaris	244
134	Reference Set Pop-Up Thesaurus and Dictionary	Reference Software	235
MULTIFUNCTION SOFTWARE			
268	E-Z-DOCS-IT	Hammer Computer Systems	265
121	Public Domain Software	Public Domain Software	249
127	Free Public Domain Software	Public Domain Software	231
347	Macros	Symyx Design	29
1	Adhesive Soft	Trucon Instruments	13
INTEGRATED SOFTWARE			
198	Enable	Software Group, The	94-95
121	1-2-3 Report Writer, 1-2-3 Upgrade	Lotus Development Corp.	72-73
276	New & B	Texter Mail Publishing	200, 205
COMPILED			
142	Personal Family	Borland International	167
PROGRAMMER'S TOOLS			
113	Lattice Trivision Tool Basket	Lattice	85
113	Programmer's Tools	PC Brand (Formerly Ascent)	26-25
149	Screen Software	Screen Software	211
DATA BASE MANAGERS			
174	GP Tools dBase Manager	Allen Harris Industries	242
178	CompuBase	Info Com	48-49

135	Knowledge Man/MDBS II LAN	Micro Data Base Systems	50
1	R-Base	Macros	24-75
1	Database Manager	Parsons & Pacific Engineering	4
PROGRAM DEVELOPER/GENERATOR TOOL			
247	Quick Mac	Fox and Geller	70
1	"Flashcode"	Software Building	213
SORT MERGE TOOLS			
197	Sort Merge Tool	Compucon Control	284
TEXT EDITORS			
142	SP-PC	Command Technology Corp.	212
OTHER UTILITIES			
146	PC Tools, Copy II PC	Central Point Software	215
140	Disk Mechanic	MLJ Microsystems	236
146	Normal Utilities, The	Normal Utilities, The	217
129	Pro Key	Row Soft	157
IBM PC COMPATIBLE COMPUTERS			
179	PC 10 & PC 286	Gulfstream Microsystems	29
232	SAM 800	IBM Tech International	196-197
1	The AT	IBM Entry Systems Division	
ACCESSORY CARDS			
157	PC Option	Central Point Software	217
MULTIFUNCTION BOARDS			
121	QIC 04, QIC 06	QIC Research	148
VIDEO/GRAPHICS BOARD			
101	Color Graphics	AST Research	102
102	Color Graphics	AST Research	102
144	Hercules Color Card	Hercules Computer Technology	121
145	Hercules Graphics Card	Hercules Computer Technology	121
145	Modular Graphics Card	Panasonic Systems	55
INTERFACE DEVICES			
371	SBRT Support	Summa Storage	67
141	Summa Storage	Summa Storage	203, 205
MASS STORAGE HARDWARE			
131	Disk Subsystem	CIA	234
171	RAM Plus	Creative Micro, Inc.	233
177	Type Backup and Hard Disk	Expansys Systems, Inc.	206-207
143	W. T. Magnetic Tape Subsystem	W. T. Magnetic Tape Subsystem	244
312	D. BASE Management	Seavale Software	236
143	Q-File	Syrinx Inc.	18-19
222	Winchester	Tallmadge Technologies	18-19
501	QIC 40	Tecmar	C2
COMMUNICATIONS HARDWARE			
225	Mac Charlie	Dynas Communications	23
MODEM			
121	QIC 04	QIC Research	148
364	PC Modem Half Card	Venustek	14
NETWORKING			
135	MDBS II LAN Knowledge Man	Micro Data Base Systems	50
185	LAN Network	Probus Inc.	90
128	Easy Link	Server Technology	99
991	MultiLink Advanced	Software Link, Inc.	182
OTHER COMMUNICATIONS HARDWARE			
127	Modem & Base Unit	The MOM Corp.	62
DISPLAYS/MONITORS			
149	Prism Graphics Systems	Prism Graphics Systems	105-107
173	Scopy Monitor	Sony Information Products	146-147
149	Taxim Monitors	Taxim	13
PRINTERS			
183	Pro Printer	IBM Information Systems Group	131
TONERS			
361	Fontary	Perot	97
PRINTER DRIVERS			
175	Printer Base	Connectix Software	61
244	Lectrix	Hannaball	177
FURNITURE			
230	Compucon Furniture	Simonson Industries	16
DISKETTES			
149	Disks	Disks	245
244	Mail Order Disks	Disk World	240
244	Mail Order Disks	Disk World	240
130	Mail Order Disks	Disk World	240
147	Mail Order Disks	Conark	285
ACCESSORIES			
123	Cable Accessories	Cable Accessories	C4
123	Cable Accessories	Compucon	48
OTHER SUPPLIES			
314	Tilt-A-Ton, CRT Terminal	Micro Computer Accessories	171
314	Valley Rollup 100 Disk File, The	Micro Computer Accessories	172
LITERATURE			
203	The Manual	Management Information Source	249
ORGANIZATIONS AND SERVICES			
226	Executive News Service	Compucon Information Service	96
141	Service	IBM Information Systems Group	189



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Coming Up

Programming for Businesses

Personal computer users are programming their PCs in record numbers. *PC Magazine's* recent reader survey tells us that over 60 percent of our readers enhance their PCs' usefulness by modifying commercial software and writing short utilities—or at least by keying in the programs listed in *PC Magazine's* Programming column.

In response to this growing interest, *PC Magazine* presents an in-depth examination of the many ways and means of programming your PC. We recruited professional programmers in the five most popular and useful languages—BASIC, Pascal, COBOL, C, and assembly—to test and review commercial compilers and translators of each language. They also enrich you with their outspoken views on the languages they specialize in, resulting in an insightful and informative package that no power user (or aspiring power user) of the PC will want to miss.

PC Storyboard

IBM's new *PC Storyboard* is a powerful graphics program that does everything a graphics package is expected to do and more. For starters, it lets you create and edit business graphics and frehand drawings, combine business graphics with your drawings, and create customized typefaces. You can even incorporate "snapshots" of whatever you can put on your screen into your finished designs. Best of all, though, it is easy to use, so you can take maximum advantage of its powerful features with a minimum of effort.

Six Keyboard Macro Packages

Keyboard macro packages are acquiring useful and exciting features so quickly that it is difficult for bedazzled users to keep up. To bring you abreast of all the recent advances in possibly the fastest-growing and fastest-improving category of PC software, *PC Magazine's* David Obregón rounded up and tested six of the newest and best macro packages. His findings may start you off on the road to making more productive use of your PC.

The Price Waterhouse Report

The accounting experts at Price Waterhouse take on the *Back to Basics Accounting System*, a powerful entry-level accounting package from Peachtree. If you're looking for simple-but-effective low-end software to automate your small-business's accounting records, *PC Magazine's* Price Waterhouse Report is the place to look.

Slot-Saving Combo Boards

Two new combination cards—Quadram's Gold Quadboard and the Persyst Color Combo Card—can save you both money and expansion slots in your PC by getting more functions than ever before onto a single board. If your PC is configured to the limit and still lacks that one last essential add-in item, you'll want to read Frank Derfler's review of these two winners.



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Index To Advertisers

RS #	Advertisers	Page	RS #	Advertisers	Page	RS #	Advertisers	Page	RS #	Advertisers	Page
234	Allen Harris Industries	342	117	Discount Computer Centers	80	386	Magnus PC	252	527	Public Domain Software	231
138	Analytics International	155	108	Discount Microsales	227	237	Main Street Computer	218	121	Qc Research	148
114	Arlington Computer Products	156	109	Discount Microsales	157	159	Maynard Electronics	47	354	Qube	30-31
110	A S Gibson & Sons, Inc.	69	*	Discrete Connection, The	245	168	MCBS	93	*	Reference	235
101	AST Research, Inc.	102	240	Disk World!	240	525	MDBS	C3	115	Rose Associates	237
102	AST Research, Inc.	9	344	Disk World!	247	135	MDBS	50	129	Rossoft	1
107	Bay Express	241	130	Disk World!	224	150	MECA	165-167	154	Sacilite Software	
103	Belhott	11	305	Dynatex Computer Power Inc.	171	151	MECA	164	International	32	
116	Blah Software Inc.	236	*	Earls Publishing	243	314	Micro Computer Accessories	172	321	Sav-On Computers	238
147	Borland International	163	235	Eastern Enterprises	261	133	Micro Mart	22-23	*	Schior Corp	86
142	Borland International	164	206	Elite Software	284	332	Microrentals	250	312	Seaside Software	216
*	Business Computers	225	177	Express Systems	206-207	*	Microsim	74-75	124	Server Technology	89
152	Central Point Software	215	180	Flagstaff Engineering	12	338	Microshop	256	347	Sigma Design	29
156	Central Point Software	219	242	474 Computer	96-97	*	Microsoft	138-139	220	Sincom Industries	16
157	Central Point Software	217	247	Fox & Geller	78	326	Microsoft	88	*	Softline	79
120	CIA	216	266	General Technology	70	331	MicroWay, Inc.	62	169	Software Bottling	
167	Comark	285	319	Gulfstream Microsystems	28	208	Ministry Hi Tech Industries	251	Company	213	
182	Command Technology Corp.	212	260	H&E Computers	290	340	MLI Microsystems	236	171	Software Bottling Company	211
139	Companion Software	200	268	Hammer Computer Systems	265	127	MOM Corp. The	92	198	Software Group	94-95
228	CompuAdd Corp.	206-207	284	Hammerlab	177	126	Northstream Software	20-21	193	Software Link, Inc.	182
205	CompuLink	282	162	Handic Software	175	340	Notion Utilities	217	373	Sony Information Systems	146-147
*	COMPUMAIL	280	119	Hauppauge Computer Works	10	141	Olden Computer	194	497	Spectrum Software	228
236	Compuserve Information Service	96	146	Hercules Computer Technology	121	*	Paradise Systems	55	172	SPSS Inc.	196
192	Computer Control	284	145	Hercules Computer Technology	195	204	PC America	262	*	Summa Graphics	283
181	Computer Mail Order	76-77	*	Hi Tech International	8	311	PC Brand	24-25	111	Summa Graphics	285
183	Computer Mart	214	158	Hypergraphics	232	339	PC Connection	36-37	*	Sygen Industries	58
123	Computer Scooter	68	143	Ilex Computer Corp.	244	245	PC Network	64-67	222	Talgrass Technologies	18-19
155	Computer Vector	68	232	IBM Entry Division	196-197	179	PC's Limited	52-53	489	Taxon	208
175	Connectix Software	61	163	IBM ISG Division	131	144	PC Software Interest Group	245	501	Tecmar Inc.	C2
125	Conroy-La Pointe, Inc.	45	164	IBM ISG Division	189	365	Persoft	5	170	Telsoft	see Telemat
140	Corporatix	42	178	Infocom	48-49	176	Photon	188	170	Telemat	248
131	Creative Microsales	233	243	In-House Software	44	134	Polaris	244	*	Text Instruments	13
*	Curtis Manufacturing	C4	*	James River Group	204	*	Potomac Pacific Engineering Inc.	4	*	Turner Hall Publishing	200
*	Cypnet Technology	91	343	K Software House	250	187	Primavera Systems, Inc.	246	276	Turner Hall Publishing	201
148	Dac Software, Inc.	17	113	Lattice	85	149	Princeton Graphics Systems	185-187	364	Vatel	14
122	Data Copy	87	202	Logisoft	82-84	309	Progressive Micro		361	Walton Associates	201
229	Data Transforms	202	*	Lotus Development Corp.	72-73		Distributions	26-27	*	Warehouse Data Products	66
225	Dynia Communications	2-3	*	Lotus Development Corp.	71	165	Prolan	90	153	Westlake Data Corp.	264
161	Decision Resources	40-41	263	Macola Inc.	39	301	Prosoft	57	*	XY Quest Inc.	239
112	Digital	210	203	Management Information Source	249						

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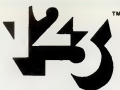
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